Heating Piping & Air Conditioning

APRIL 1956

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INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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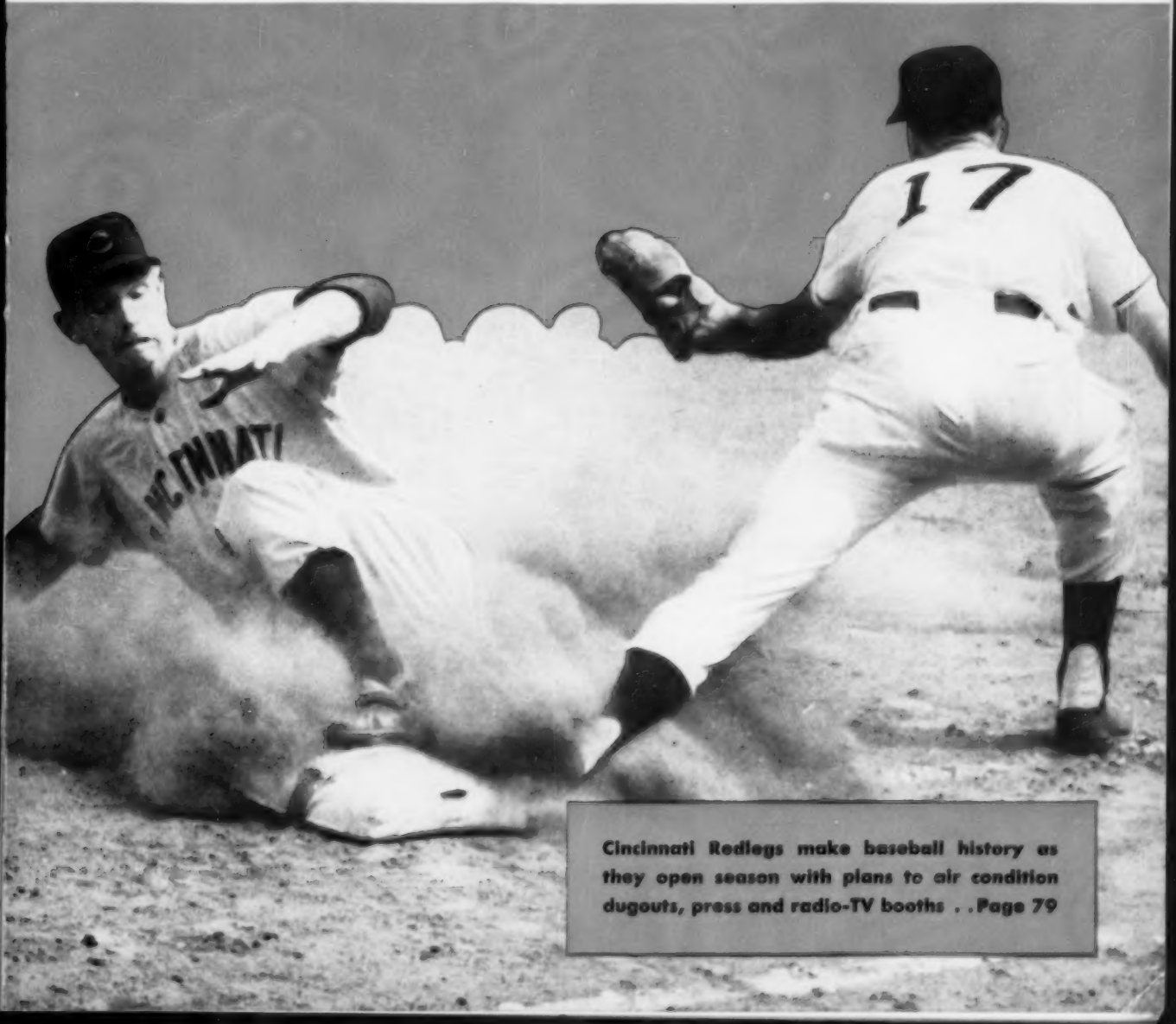


Cincinnati Redlegs make baseball history as they open season with plans to air condition dugouts, press and radio-TV booths . . Page 79

NOW... greater piping loads, longer travels, with less headroom

The Grinnell Model R Constant-Support Pipe Hanger is available now in an *extended range* of sizes to provide completely overlapping coverage of loads from 47 lbs. to 32,267 lbs., and with travels up to 12 inches. New design modifications permit these hangers to be installed with a minimum of headroom, ranging from 29 inches (rod take-out) for the largest size — down to 10¾ inches for the smallest size.

The Model R provides constant support which is mathematically perfect for all positions of travel. This constancy of support is maintained throughout the full range of field adjustability. Needle bearings minimize friction.

Grinnell Constant-Supports are individually calibrated to support the exact load specified. All Model R Constant-Supports have a full 70 percentage points of field adjustability built into them. No less than 10% of this adjustability is allowed either side of calibration for plus or minus change in load. Field re-adjustments are easily made by turning a single load adjustment bolt.

Grinnell designs, manufactures, and distributes a complete line of pipe hangers and supports for every piping requirement. Grinnell maintains an experienced staff of engineers in the field — ready to assist you on the job with any piping problem.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

usAIRco central station

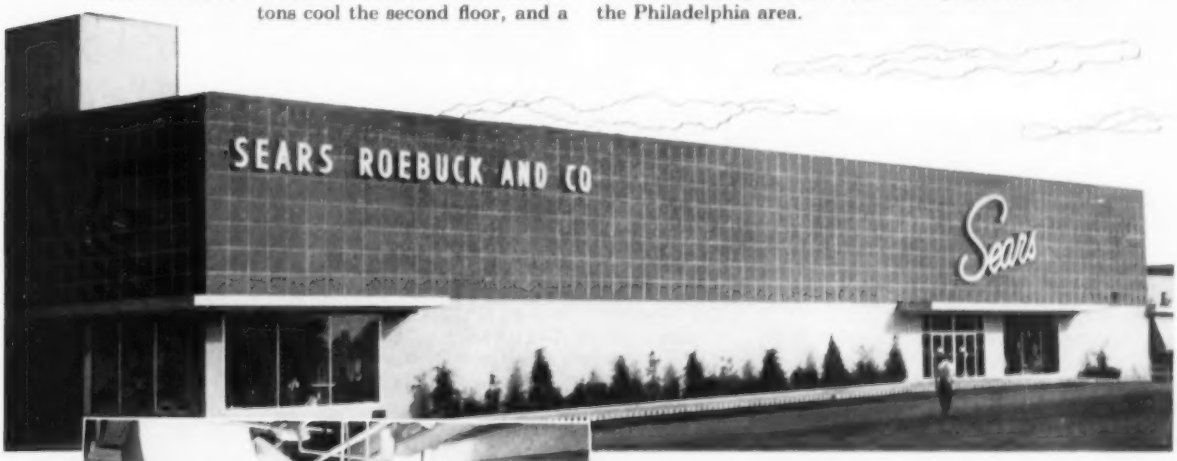
RK units cool and heat new windowless Sears store...

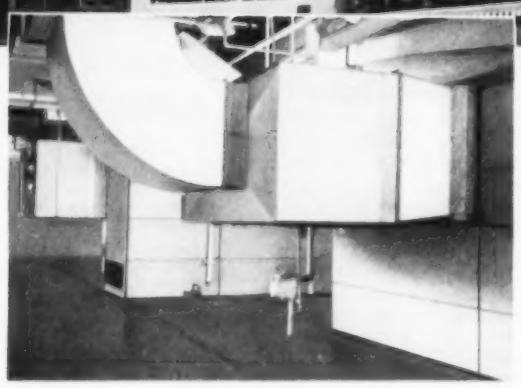
A 120-ton zoned year-round air conditioning system, utilizing 3 usAIRco RK self contained central station units, is now in operation in the new Sears, Roebuck & Company store in the Logan Square Shopping Center, Norristown, Pennsylvania. The 60,000 square foot, three-floor Sears building is the main unit of a 20-acre shopping center developed by Logan Square, Inc., owners, from plans by Herbert Anderson, architect. Three usAIRco RK units provide cooling, heating and ventilating for the windowless structure. A 50-ton RK serves the main floor, 40 tons cool the second floor, and a third unit, with 30 tons of cooling capacity, handles the basement.

All units are located in a second floor equipment room and are equipped with 1-row steam coils for winter heating. The system is designed to provide automatic heating-cooling changeover and to furnish 100 per cent fresh air for ventilation.

The system was installed by Clermont Engineering Co., Inc., heating and air conditioning contractor, the Irwin & Leighton Co. were the general contractors.

W. W. Malloy is the usAIRco representative in the Philadelphia area.





Three units provide 3-zone system located in second floor equipment room

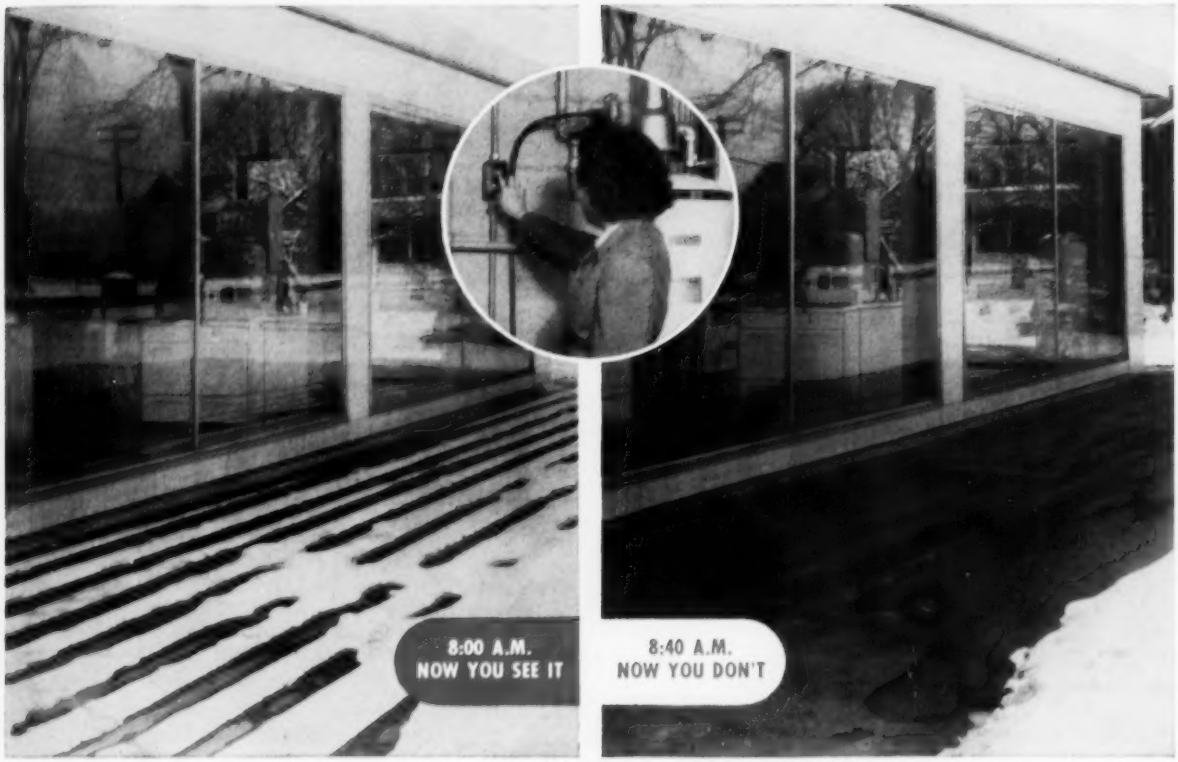
The usAIRco RK equipment contains all of the elements of a central air conditioning plant, including built-in evaporative condenser in a single casing. All vital components of each unit are enclosed in an assembly for maximum compactness, allowing ample room for access in the equipment room. Steam coils provide winter heating.

For descriptive literature, write C. S. Hawkinson

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA. *Export: 13 E. 49th Street, New York 16, N. Y.*

usAIRco
50 YEARS OF AIR CONDITIONING



8-year old WROUGHT IRON PIPE SNOW MELTING SYSTEM still performing WINTER MAGIC

Giving winter snows the "hot foot" is an old story for The Protane Corporation, Erie, Pa.

Their snow melting system dates back to 1947 when a network of wrought iron pipe grids, 12-feet wide and 51-feet long, was installed under the sidewalk in front of their LP-Gas service building.

How efficiently the system has worked since installation is shown in the above photographs which were taken after a four-inch snowfall. The picture at the left illustrates the melting in process. Here, a hot water and antifreeze solution, flowing through the embedded pipes, is clearing the snow. Note that there is no run-off water. The snow melts, and quickly evaporates. In the picture at the right, taken 40 minutes later, all the snow has disappeared and the sidewalk is virtually free of moisture.

Starting the system is a simple matter. A push of a single button (see insert photo above) activates a high velocity pump and hot water is circulated through the wrought iron pipe system.

The Protane Corporation is gratified with the efficiency of this automatic "winter magic." But the real record, as far as they're concerned, is the trouble-free operation. "Eight years without maintenance, and the system is still going strong," is their report.

There are good reasons for the dependable, trouble-free service of wrought iron pipe in snow melting systems. You'll find complete information on why wrought iron lasts long, at lower cost per year, in our bulletin, *Byers Wrought Iron Pipe for Snow Melting Systems.* Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

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BEST FOR SNOW MELTING BECAUSE . . .

It resists corrosion longer . . . it provides high heat transmission . . . it expands and contracts at virtually the same rate as concrete . . . it forms and welds easily on the job . . . it bends true, without spring-back . . . it assures sound welds and sharp, full depth threads . . . it withstands installation damage. No doubt about it . . . the advantages of wrought iron pipe for snow melting systems *start with installation* and *continue in service.*

BYERS

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WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 28 No. 4

(with which is merged the Aerologist)

APRIL 1956

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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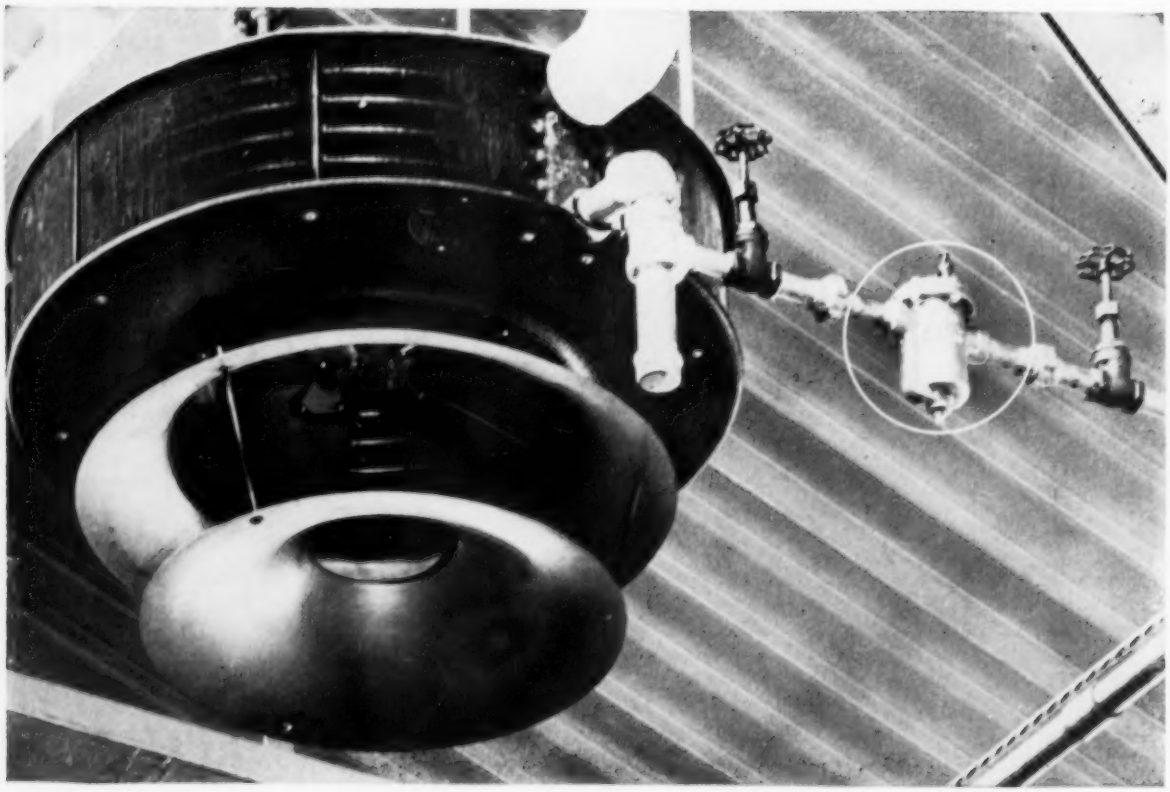

Here's the Way to Trap a Unit Heater for Lots of Heat and Little Maintenance

The picture above is an outstanding guide to good unit heater trapping. This installation provides maximum heater efficiency and minimum maintenance time and cost.

1. Simplified piping. Horizontal in-line piping is made possible by the Armstrong side inlet—side outlet trap body. Note that the trap can be opened by removing the cap, without disturbing pipe connections.

2. Dirt pocket ahead of trap. The vertical pipe leg collects heavy dirt and scale. No strainer is needed because the self-scrubbing action of an Armstrong trap washes ordinary dirt right through it.

3. Test valve. The maintenance engineer can check this trap quickly and easily by opening the test cock shown installed in the trap cap.

4. Shut-off valves and unions. The trap can be repaired, or replaced with a spare trap, without shutting off any other units.

5. Generous sized trap. The Armstrong trap, selected from Table B-29 or C-29 in The Armstrong Steam Trap Book, provides a minimum safety factor of 3 to 1 for this job. Its big air handling capacity keeps the heater free of corrosion-producing air and CO_2, provides fast heat-up and full rated btu output. No lag—condensate is discharged at steam temperature.

6. A good steam trap. The Armstrong trap discharges condensate at steam temperature and it has large air venting capacity. The heater is always full of hot, dry steam.

The Armstrong trap mechanism cannot clog, bind, stick or collapse. Valve and seat are hardened chrome steel—all other working parts are stainless.

An Armstrong trap is rated conservatively on a basis of actual hot condensate capacity under job operating conditions. This is not true of all traps and is an important factor when comparing prices.

Armstrong traps are sold by factory-trained Representatives under an unconditional, money-back guarantee of satisfaction to the user.

For the best in unit heater trapping, call your local Armstrong Representative, or write:

ARMSTRONG MACHINE WORKS
874 Maple Street • Three Rivers, Michigan

FREE—"How to Trap Unit Heaters" is the title of pages 28 and 29 in The Armstrong Steam Trap Book. This 44-page catalog is a guide to good trapping practice. Send for your copy.

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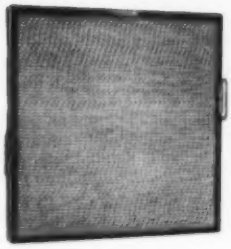
HERE'S THE SEQUEL TO "...or equal"



Standard 2" FAR-AIR Panel Filter.

Send for your copy showing complete specifications on the FAR-AIR line of quality filters.

When you see this specification..."FAR-AIR® filters or equal" remember that these filters *have no equal*. Substitutes mean contributions to the junk pile and higher eventual costs, so it pays to install the finest—FAR-AIR.

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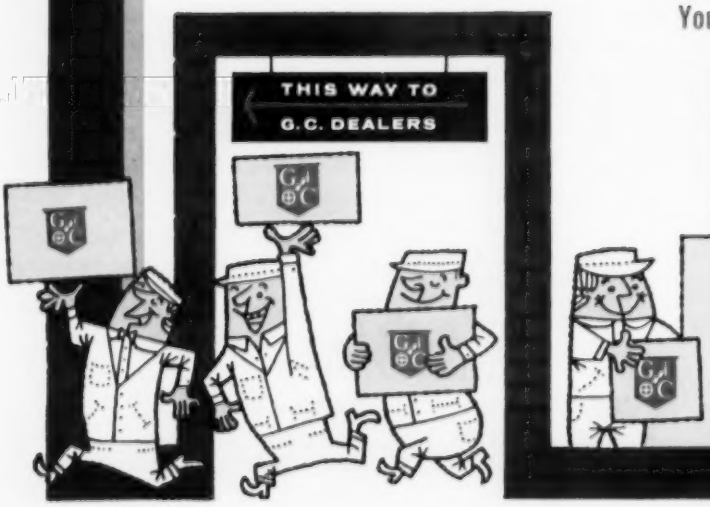

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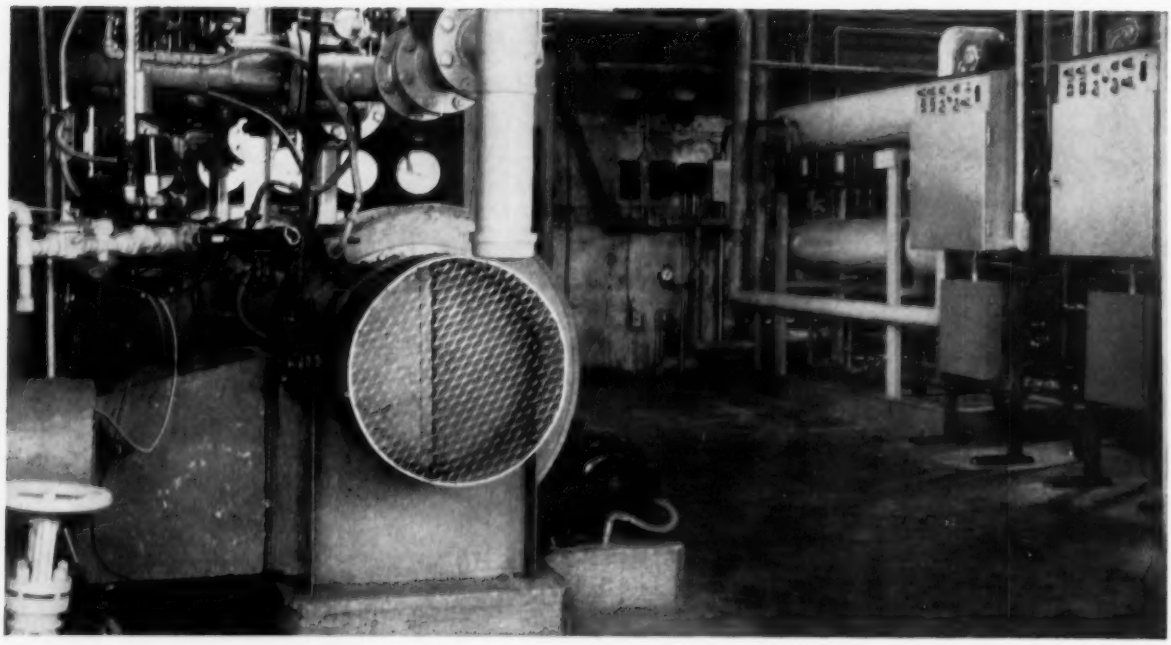
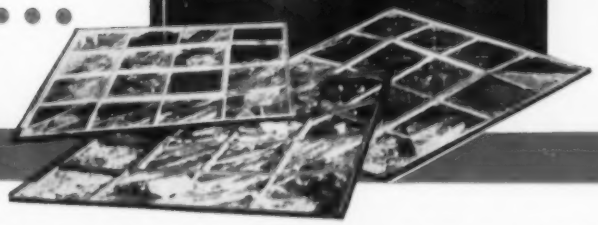


HOW FIREYE covers every step in the firing cycle —

PREVENTS hurrying or skipping steps essential to safe operation
PREVENTS light-off until combustion chamber and passages are purged clean
BLOCKS main fuel supply until pilot is proved at the right point for light-off
SHUTS OFF fuel if main flame does not stabilize within the trial-for-ignition period
SHUTS OFF fuel and sounds alarm if the flame goes out during the firing period



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. . . and no boiler room either!

The boiler had been checked only five days before, by insurance company inspectors. They found it in perfect order, and praised this modern high school for excellent boiler maintenance.

But, one night while the furnace was shut down, an unsuspected gas leak filled the combustion chamber with an explosive mixture. There was no interlocked system for pre-purging the chamber and passages, and the purge step was skipped at light-off next morning. The resulting explosion sent the boiler engineer to the hospital, and caused damage estimated at $150,000.

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The Fireye organization brings to your problems a knowledge and experience in fuel burning control that is without equal. It benefits you whenever Fireye engineers, located throughout the country, come in to survey your situation . . . supervise installation of Fireye equipment . . . check out the installation, and train your operating personnel.

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The quality specifications on the opposite page tell why "Genetron" Refrigerants are so dependable. Note their exceptionally low moisture content, their very low percentages of non-condensable gases and high boiling impurities. Here are refrigerants that can be counted upon for trouble-free performance every time!

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- **Noncorrosive to standard equipment materials**
- **Nontoxic, nonflammable, stable, safe**
- **Critical and freezing points well outside range of operating uses**
- **Solvent action on oil helps prevent solidification or congealing of lubricant**
- **Miscible with oil; aid in lubrication of equipment**
- **Identical and freely interchangeable with comparable fluorinated hydrocarbon refrigerants made by any other manufacturer meeting the same high standards**

Extremely low moisture content! Exceptionally high purity!

For Homes and Offices of the Air Conditioned Age!

Super-Dry Refrigerants

For Stores and Public Buildings of the Air Conditioned Age!

For Factories of the Air Conditioned Age!

genetron 11 ORANGE LABEL

TRICHLOROMONOFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.01
Boiling pt. at 760 mm. Hg °F.	74.7
Boiling range °F (to 85% pt.), max.	0.5

USES

Trichloromonofluoromethane ("Genetron" 11) finds widespread use as a refrigerant in industrial and commercial air conditioning systems using single or multi-stage centrifugal compressors. It can also be used for either direct or indirect expansion-type systems.

genetron 12 WHITE LABEL

DICHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.01
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	1.5
Boiling pt. at 760 mm. Hg °F.	−21.6
Boiling range °F (to 85% pt.), max.	0.5

USES

Dichlorodifluoromethane ("Genetron" 12) and Monochlorodifluoromethane ("Genetron" 141) are the most widely used organic fluorine refrigerants. They are used in virtually all types of air conditioning equipment, large and small, household and industrial, direct and indirect expansion systems.

genetron 141 GREEN LABEL

MONOCHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.01
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	1.5
Boiling pt. at 760 mm. Hg °F.	−41.4
Boiling range °F (to 85% pt.), max.	0.5

Some of the typical units in which "Genetron" 12 and 141 are used: window air conditioners, home or office console units, large store units, large custom-built units for commercial comfort, large home units for addition to present hot air heating systems, and mobile units for transportation equipment.

genetron 226 PURPLE LABEL

TRICHLOROTRIFLUOROETHANE

Quality Specifications

Moisture wt. %, max.	0.0025
Chlorides	none
Boiling pt. at 760 mm. Hg °F.	117.6
Boiling range °F (to 85% pt.), max.	1.8

USES

Trichlorotrifluoroethane ("Genetron" 226) is used in 25-ton and larger centrifugal compressors, primarily for large comfort cooling systems, brine cooling systems, and other commercial and industrial air conditioning systems.

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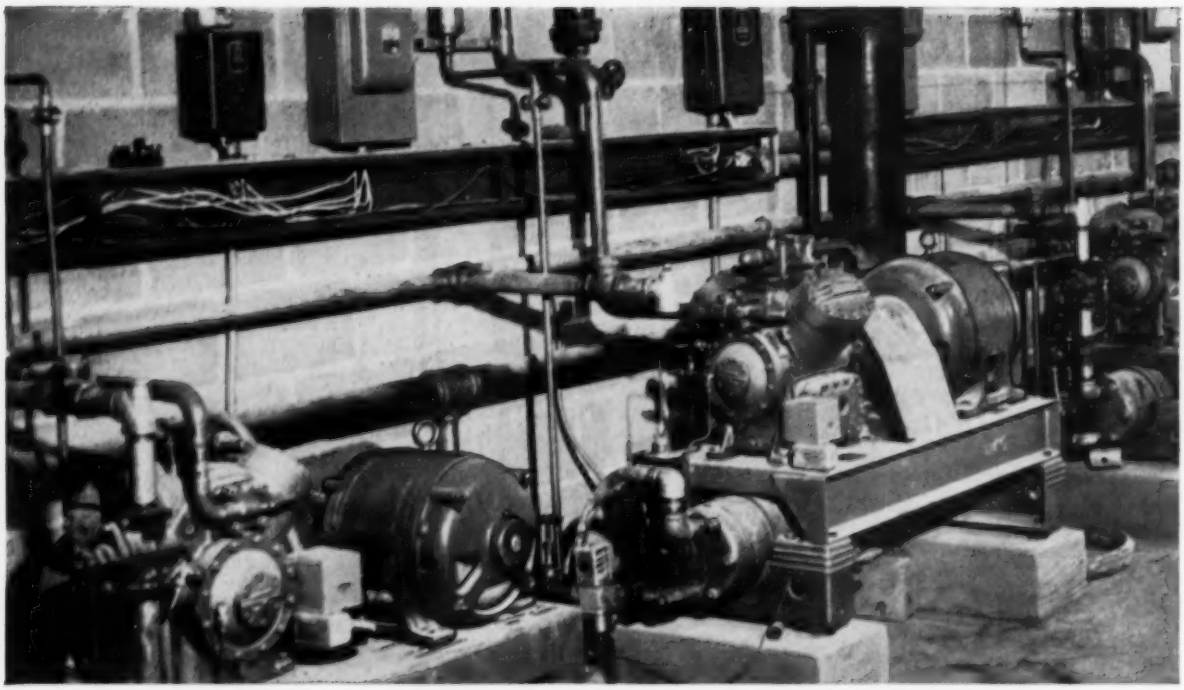

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Century **MOTORS ARE Performance-Rated**

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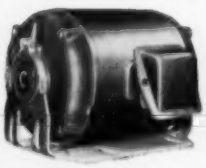
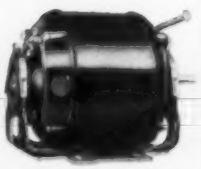
Performance-Rating means simply that from



Squirrel Cage, Polyphase Motors . . . ⅛ to 400 H.P. . . . available in drip proof and dust proof frames, with sleeve or ball bearings, foot or flange mounting (cushion base available through 5 H.P.).

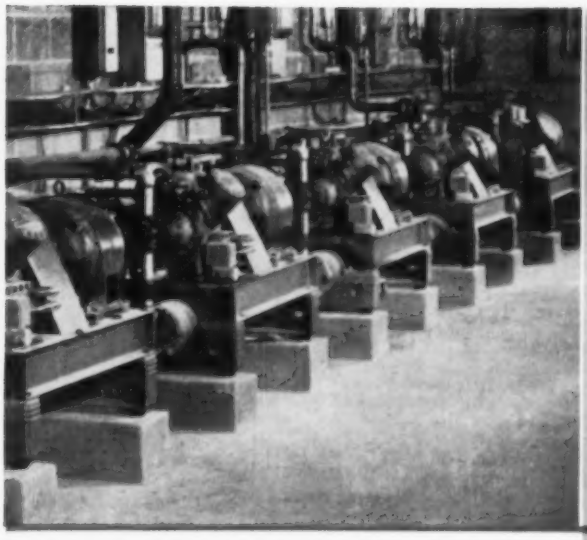
Repulsion Start, Induction Motors . . . single phase . . . ½ to 7½ H.P. . . . provide high starting torque on applications requiring unusually low starting current.

Totally Enclosed Fan Cooled Motors . . . ½ to 100 H. P. For application in atmospheres containing abnormal quantities of dust, grit, oil or chemical fumes. May be used out of doors.



Split Phase, Unit Heater Motors . . . 1/20 to ½ H.P. . . . available with extended-through bolts or cushion base . . . split capacitor, DC and polyphase types also available.

Slip Ring Motors . . . 1 to 400 H.P. . . . a favorite for applications requiring unusually low starting current. Available in drip proof, splash proof and dust proof frames.



for example: This large Midwestern warehouse refrigeration installation is powered by seven Performance-Rated Century Motors, ranging in size from 3 to 10 H.P.

Century Motors for Modern Ideas . . . AC or DC . . . Single-phase or Polyphase . . . drip proof, dust proof or explosion proof frames.

its own motor!

TO FIT YOUR SPECIFIC NEEDS

Century's complete line of motors and generators you'll get precisely the right size, speed, frame enclosure and torque characteristics you need. Century application engineers or Authorized Century Distributors are always available to help you fit a Performance-Rated Motor to your job.

IF YOU SERVICE MOTORS, YOU CAN SELL MOTORS . . .

for compressors, oil burners, blowers, heaters, pumps, fans and scores of other appliances. Century will provide you with a handsome display stand, plus an easy-to-sell assortment of motors that will put you into the profitable replacement motor business. Mail this coupon for information today!

Performance-Rated® Motors

1/8 to 400 H. P.

FOR THE FULL FACTS ON CENTURY PERFORMANCE-RATING, MAIL THIS COUPON TODAY

To CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Mo.

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Company .....

Address .....

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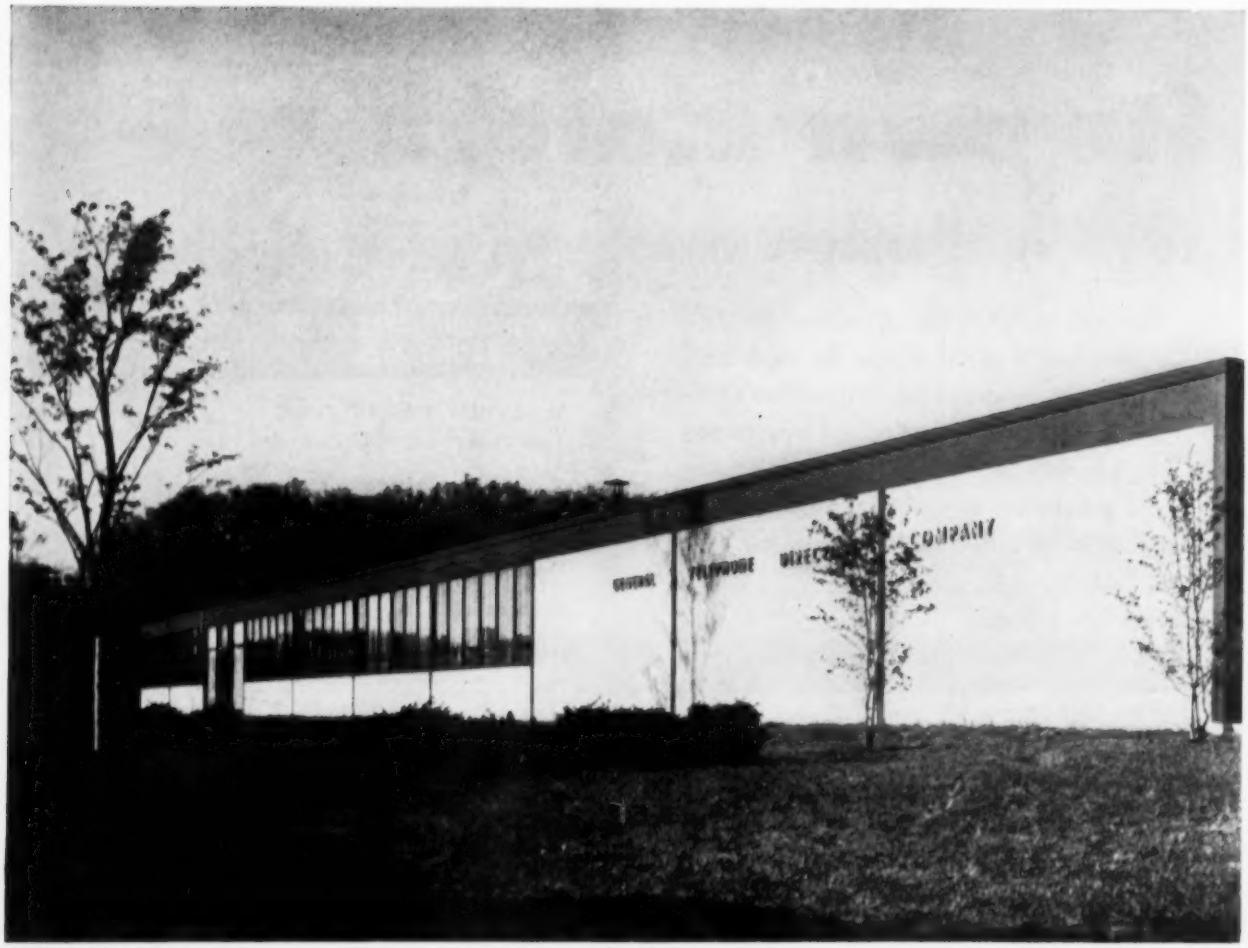
Offices and Stock Points in Principal Cities

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Temperature control story of a modern printing company

How Honeywell Electronics cuts costs,



General Telephone Directory Company, Des Plaines, Ill. (a subsidiary of General Telephone Corporation). Architects-engineers: Pace Associates. General contractor: Turner Construction Company. Heating and air conditioning contractor: Economy Plumbing and Heating Company.

Printing and paper storage area of General Telephone Directory Co. dramatizes the scope of the control job necessary in the building. In addition to maintaining ideal comfort levels, humidity must be controlled to permit most efficient conduct of printing operations.

Other major advantages of the installation are:

. . . ***big savings on cooling***—outside air is used to help cut costs of refrigeration.

. . . ***big savings on maintenance***—with electronics only one man is needed to maintain all mechanical equipment.

. . . ***an outdoor thermostat*** anticipates weather changes in winter, preventing cold weather chill.

. . . ***central control panel*** gives one man a single check and adjustment point.

. . . ***automatic sequencing***—from heating to ventilating to cooling. Comfort is controlled automatically by a single thermostat. No need for special separate thermostats.

. . . ***unusual stability*** is achieved by use of three-thermostat team—outdoors, in the space, in discharge air.

improves air conditioning system efficiency

Big-system conveniences, important operating economies, comfort—you can provide them at reasonable cost with Honeywell Electronic Temperature Control.

GOOD performance of commercial air conditioning depends on good control. Not until the recent development of Honeywell Electronics was the *best* air conditioning control economically feasible for installations of moderate size.

Now it's possible for facilities such as those of General Telephone Directory Company, Des Plaines, Illinois, to have an air conditioning system with features completely modern —features that once were restricted logically to much larger installations.

These features, explained briefly above make possible benefits that only Honeywell Electronic Customized Temperature Control can provide at sensible cost. For General Telephone they make possible an ideal indoor environment—both for the comfort of employees and for printing processes so dependent on precise control of temperature and humidity.

These benefits suggest some of the ways Honeywell Electronics can help you give your clients unprecedented comfort, convenience, economy—in heating, ventilating, air conditioning and industrial control, in any building, new or existing.

Call your Honeywell office for a new booklet that tells more fully how to apply electronics to your clients' control problems —and for information on the economical Honeywell Periodic Maintenance Plan. Or if you prefer write Honeywell, Dept. HA-4-25, Minneapolis 8, Minnesota.

MINNEAPOLIS
Honeywell
Electronic Controls

112 offices across the nation

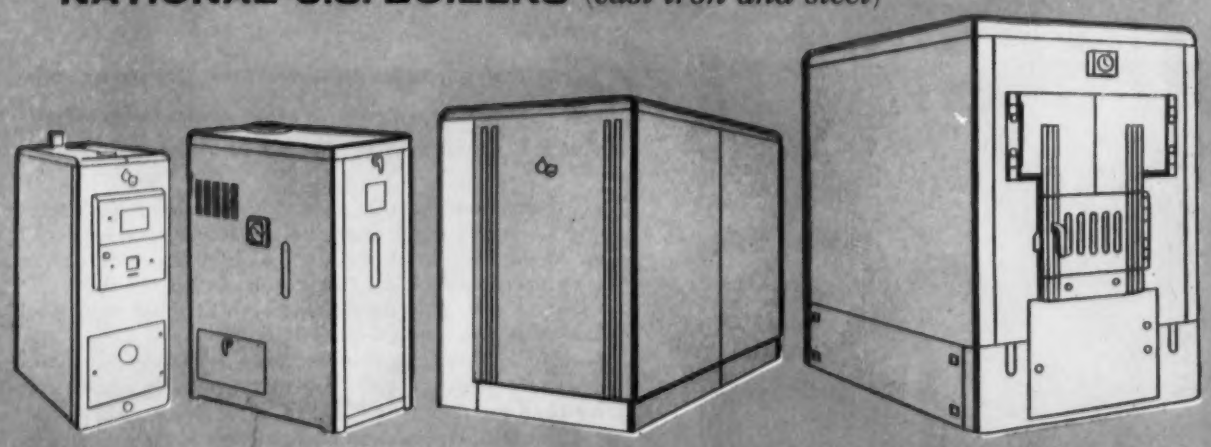
Two famous names unite

National-U.S. Radiator
CORPORATION

HEATING AND AIR CONDITIONING DIVISION

. . . to bring you new values in heating and air conditioning equipment

NATIONAL-U.S. BOILERS *(cast iron and steel)*



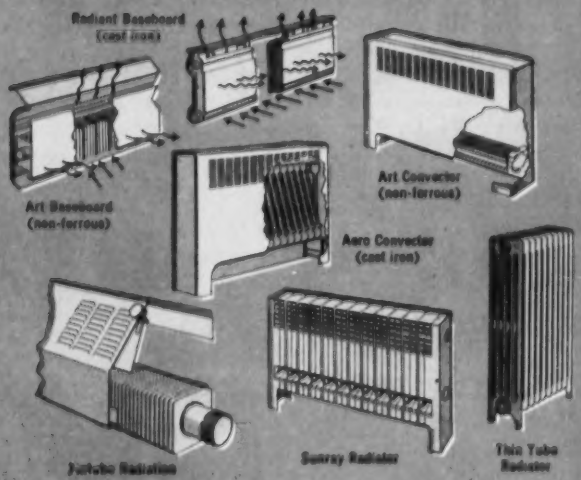
Cast Iron Boilers For Automatic Firing

Gas Boilers Residential-Commercial

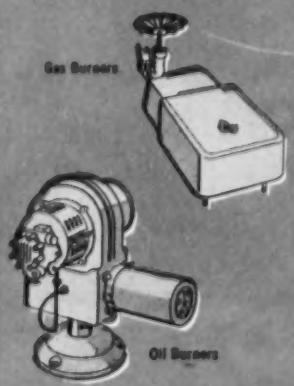
Oil Boilers and Oil Heating Units

All-Fuels Boilers Convertible Type

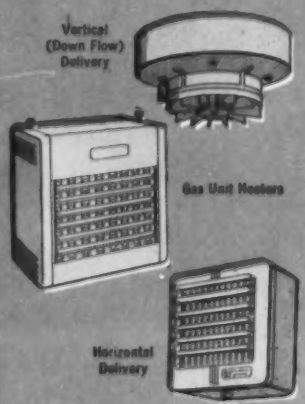
NATIONAL-U.S. HEAT DISTRIBUTORS



NATIONAL-U.S. CONVERSION BURNERS

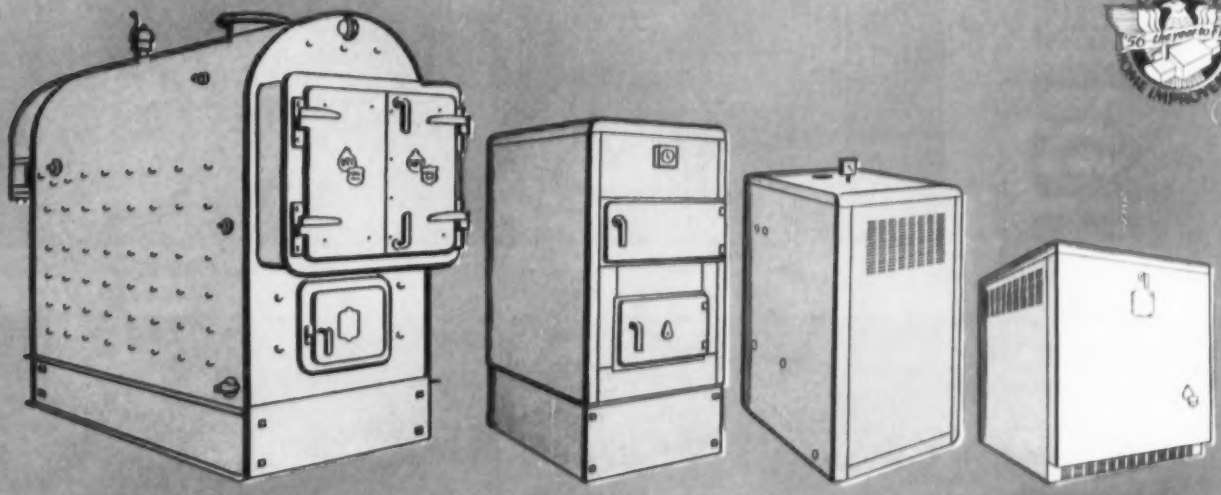


NATIONAL-U.S. UNIT HEATERS *(gas, steam, hot water)*



Now... one source of supply provides:

- the most complete heating and air conditioning product catalog in the industry
- the highest standards of quality and service
- a new combination of top-flight engineering for product development and research
- nationwide manufacturing plants and sales offices to service you quickly and efficiently



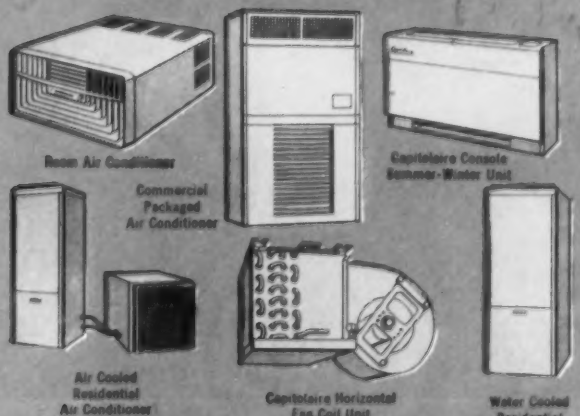
Commercial Steel Boilers for Automatic and Hand Firing

Residential Steel Boilers

Residential Steel Oil Heating Units

National-U.S. Packets for Gas or Oil Firing

CAPITOLAIRE AIR CONDITIONERS



Room Air Conditioner

Commercial Packaged Air Conditioner

Capitolaire Console Summer-Winter Unit

Air Cooled Residential Air Conditioner

Capitolaire Horizontal Fan Coil Unit

Water Cooled Residential Air Conditioner

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See your nearest National-U.S. Wholesalers

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National-U.S. Radiator
CORPORATION

HEATING AND AIR CONDITIONING DIVISION
Johnstown, Pennsylvania

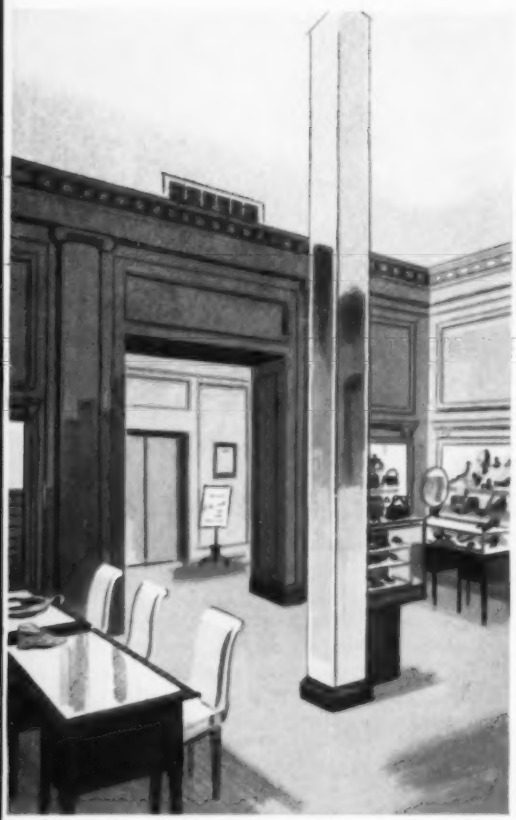
SALES OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES

This newly compiled National-U.S. literature contains full information on each individual product in the complete line of Heating and Air Conditioning products

Carrier again makes news

▲ *Carrier Weathermakers without ductwork cool supermarket*

Carrier High-Velocity System ▼ *is ideal for "interior zones."*



▲ *Carrier Zoning Weathermaker keeps comfort constant. Air-Cooled Weathermakers serve smaller stores.* ▼

Here are the best ways to air condition a supermarket, a shopping center, a department store

The odds are high that air conditioning will be a factor in any supermarket, shopping center or department store you're commissioned to do.

Your job: select the type of air conditioning that will best fit your plan and the client's requirements.

Here's where knowing the breadth of the Carrier line can save time for you and money for your clients. Carrier has *all* the ways to air condition *any* job. A few examples . . .

New Carrier Weathermaker* (top left). It's the self-contained air conditioner designed for lower installation costs. For small supermarkets, it gives the equivalent of a customized, built-in system—at lower cost. Exclusive design features give the new Weathermaker extreme flexibility of application.

Carrier High-Velocity System (bottom left). Developed by Carrier primarily for the "interior zone" of stores and buildings. It features small cross-section ducts and conduits, all-around compactness, ease of installation, simplified maintenance, quietness, and great flexibility.

Carrier Zoning Weathermaker (top right). You can plan "departmentalized" air conditioning which gives each area of the store or building the climate it orders. Carrier Zoning Weathermakers will keep comfort constant in as many as 14 different zones, regardless of differences or changes in heat loads.

Carrier Air-Cooled Weathermaker (bottom right). It air conditions without water. Location of unit is not dependent on water supply. Fewer connections mean simplified installation. Maintenance costs are appreciably lower than for water-cooled models that require water-saving devices.

All Carrier equipment is engineered to the same high standard of quality. This means you can short-cut hours of selection by (1) using the Carrier line as your shopping guide and then (2) comparing values. Get in touch with your Carrier dealer or distributor—listed in the Classified Telephone Directory. Or write directly to us: Carrier Corporation, Syracuse, New York. *Reg. U.S. Pat. Off.

Carrier

air conditioning • refrigeration • industrial heating

Novel B & G Hydro-Flo installation

Satisfactory and economical Motel heating has been notoriously difficult because of rambling construction and irregular occupancy. For the same reasons, summer cooling presents similar problems.

In the installation illustrated here, water again proves its case as the most versatile and efficient medium for both heating and cooling. It is a split system, employing both radiant floor panels and fan type wall convectors, both circulated with water.

During the heating season, the floor panels maintain a temperature of 60° when the rooms are not being used. When occupied, the fan type convectors are used to increase the heat input. Four-speed manual control of the convector fans gives each guest a choice of temperatures.

In summer, the same convectors are circulated with

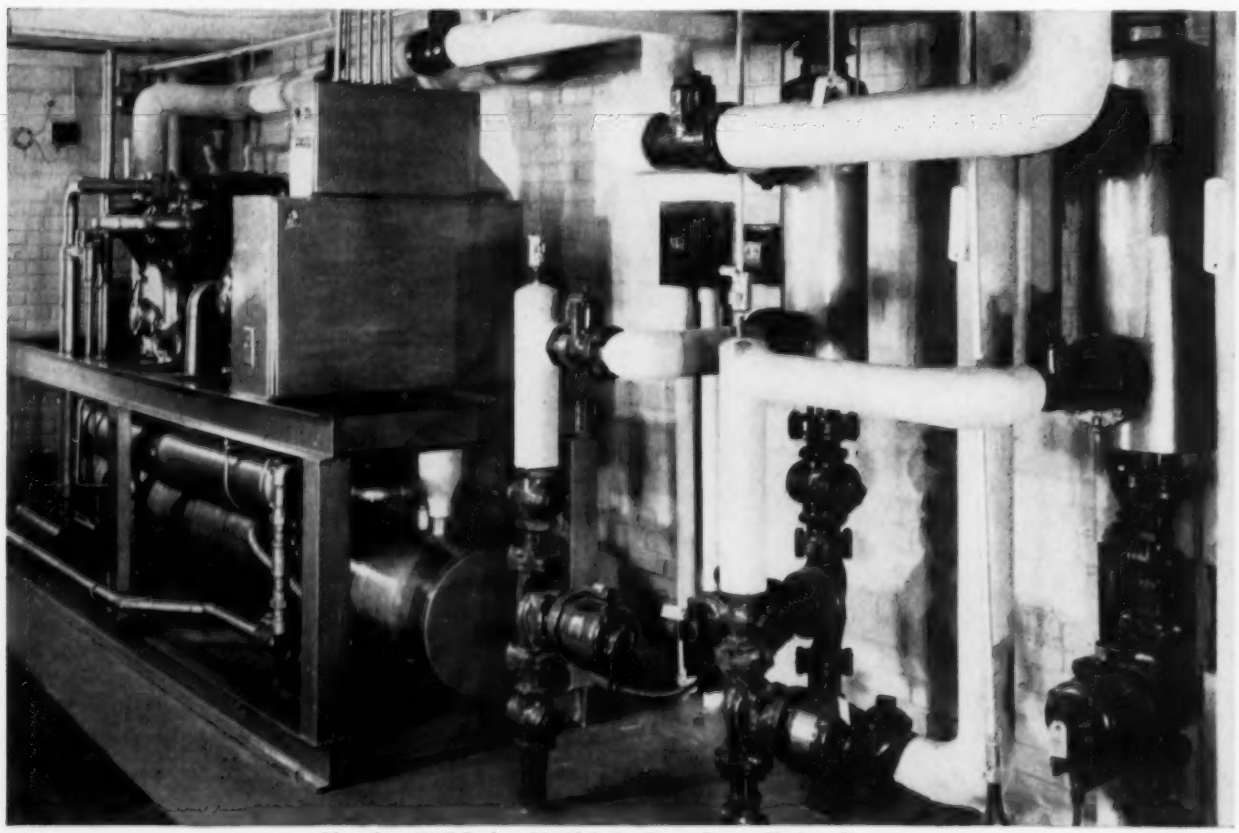


Photo shows B&G Package Liquid Cooler, Booster Pumps, Flo-Control Valves and other auxiliary equipment used in motel installation.

Weller's Motel, Niles, Illinois

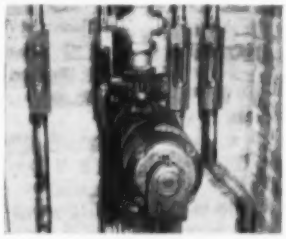
Fan type wall convectors supply additional heat when required and cooled, de-humidified air for summer cooling.

solves motel heating and cooling problem

chilled water from a B&G Package Liquid Cooler and deliver cooled, de-humidified air to the rooms. An inside cooling tower uses attic air for cooling the condenser water, thereby reducing the cooling load by several tons.

Completely automatic control

The control system is particularly interesting. The change-over from heating to cooling is completely automatic and is handled by two outdoor-type controls, which modulate both heating and cooling water in accordance with outdoor temperature. There are no inside thermostats.



B&G Thermoflo Balancers permit exact balancing of water flow through radiant panel heating circuits.

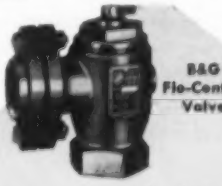
A special mixing tank is used, in which continuously circulating system water is mixed with boiler or chiller water. When the outdoor control for the heating cycle senses the need for additional heat, it activates a pump which supplies hot boiler water to the mixing tank. When the outdoor temperature reaches 78° the control for the cooling cycle energizes a pump which circulates chilled water from the B&G Package Liquid Cooler to the mixing tank.

For further information on B&G *Hydro-Flo* combination heating and cooling systems, send for Bulletin HB-755.

B&G *Hydro-Flo* PRODUCTS

for heating and cooling with water

B&G Booster



B&G Flo-Control Valve

B&G Monoflo Fitting

B&G ASME Relief Valve

B&G Airtrol System

B&G Water Heater

B&G Package Liquid Cooler

BELL & GOSSETT

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another outstanding

"HEAT PUMP" INSTALLATION

with

JOHNSON CONTROL

In one of the first applications of its kind, a complete heat pump system is combined with radiant panel heating and cooling as well as central fan air conditioning

*Simms Building, Albuquerque, N. M. Flatow & Moore, architects; Bridgers & Paxton, mechanical engineers; all of Albuquerque.

Albuquerque's new Simms Building* is widely recognized as an outstanding example of modern design and high functional efficiency. Equally impressive are the building's mechanical facilities, which include a reverse cycle "heat pump" combined with a radiant panel heating and cooling system and six central fan systems for heating, cooling and ventilation.

The successful operation of this modern air conditioning installation requires a control system capable of solving a constantly varying array of intricate control problems, some of which are cited on the opposite page.

All of these problems and many others are solved with precision by a specially engineered system of Johnson Control. Each part of the mechanical system is controlled in perfect coordination with the others. Johnson Control provides the accuracy and flexibility to insure complete, year 'round comfort throughout the entire building. And, equally important, it gives the Simms Building the economies of virtually waste-free heating and cooling performance.

The superior comfort and economy features of Johnson Air Conditioning Control can be applied to any building, regardless of its type or size. Whether your particular problems demand this kind of intricate control system or a very simple arrangement of thermostats and valves or dampers, look to Johnson for the best solution. A nearby Johnson engineer will gladly give you his recommendations without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

Panel mounted Johnson instruments permit easy remote observation of air and water temperatures at key points in the system. Hot and chilled water and well water temperatures are automatically recorded.

JOHNSON CONTROL

SINCE 1885

PLANNING • MANUFACTURING • INSTALLING

RADIANT PANEL CONTROL

Radiant panels for heating and cooling are located above and below glass areas. Panel water temperatures on the north side are controlled by a Johnson Master Thermostat which measures the outdoor temperature. On the south, water temperatures are varied by a solar compensated Master Thermostat that measures the combined effect of outdoor temperature and solar heat gain.

The two Master Thermostats reset Submaster Thermostats controlling Johnson Three-Way Mixing Valves on the heated and chilled water supplies. Solar heat gain requires simultaneous heating and cooling, even when outdoor temperatures are below 20°F.

T-900 Master Thermostat

V-108 Three-Way Mixing Valve

T-901 Submaster Thermostat

FAN SYSTEM CONTROL

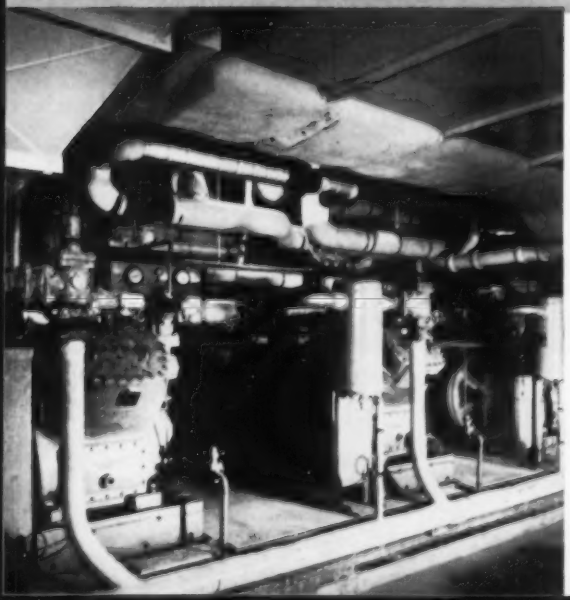
Air for heating, cooling and ventilation is supplied by six central fan systems which operate under the efficient direction of Johnson Controllers. Each shop and commercial space on the main floor is a separate zone, while the balance of the building is zoned by floors and exposure.

Strategically located Johnson Room Thermostats, controlling Mixing Dampers on the hot and cold plenums of the units, insure constant supplies of perfectly conditioned air throughout each zone. Fan systems are also controlled to permit some areas to be heated at the same time others are being cooled. Static Pressure Regulators maintain a 0" differential between hot and cold plenums of the units.

T-400 Room Thermostat

D-251 Piston Damper Operator

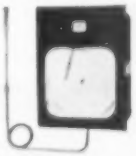
R-302 Static Pressure Regulator



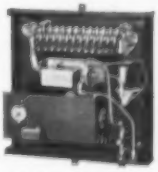
"HEAT PUMP" CONTROL

A Johnson Recorder-Controller determines the overall demand for heating and cooling in accordance with outdoor temperatures and, acting through Submaster Thermostats, Limit Thermostats and Johnson Valves, controls the primary supplies and temperatures of heated and chilled water for the panels and fan systems.

Changeover between heating, intermediate and cooling cycles is completely automatic. A Pneumatic Step Controller minimizes power demands by varying and limiting the capacity of the three 100-h.p. refrigeration compressors in 50-ton increments. Other Johnson Controllers regulate water pressures throughout the system and control the admission and discharge of well water.



T-1000 Recorder-Controller



G-180 Pneumatic Step Controller

T-800 Remote Bulb Thermostat

FREE...

IMPORTANT BULLETIN FOR AIR CONDITIONING MACHINERY MANUFACTURERS!

PLEASE SEND FULL INFORMATION ON SEALMASTER RUBBER MOUNTED BEARING UNITS.

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SEALMASTER'S *EXCLUSIVE* combination of features mean smoother, quieter performance for your product!

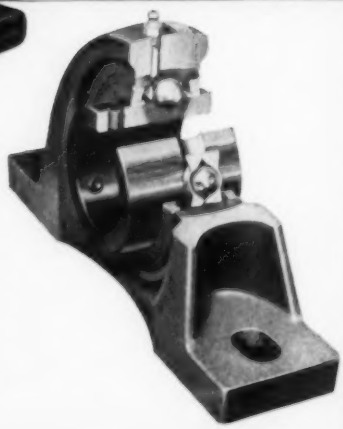
This new rubber mounted self-aligning SEALMASTER Ball Bearing unit will afford an added sales feature for your product and provide years of trouble-free, quiet operation that will build customer satisfaction and repeat sales. Designed to reduce noise and vibration, a Zone Hardened SEALMASTER Ball Bearing Unit is mounted in a synthetic oil-resistant rubber ring which fits snugly into a pressed steel housing. These units are available in pillow blocks, flange units or cartridge units (for insertion in special and built-in housings.)

Direct factory representatives and stocking distributors in all principal cities.

SEALMASTER

BALL BEARING UNITS

And don't forget — SEALMASTERS standard line of bearings in cast iron housings. They are serving America's leading air conditioning equipment manufacturers with an exclusive combination of features that guarantees long, maintenance-free life. Write for bulletin 454.



SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO., 47 RIDGEWAY AVENUE, AURORA, ILLINOIS

Get in on the best training program in packaged air conditioning!

York's new training course took years to develop, but there's nothing like it in the industry! You'll be taught by factory-trained experts. You'll learn everything you need to know about packaged air conditioners—how to sell, install and service them—and you won't have to be an engineer to follow what's going on. Get complete details. See your York distributor, or mail this coupon today!

Manager of Sales, Commercial Division
York Corporation, York, Pa.

Tell me how York's new training program for Yorkaire dealers will put more dollars in my pocket.

Name _____

Company _____

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HPA

York refrigeration air conditioning gives you more training...more models...more quality...more profits!

You name it, York makes it! Waterless and water-cooled units from 2 hp. to 15 hp.; models for off the floor, through the wall, remote, and multi-space installations. York has the answer to every air-conditioning problem.

Greater cooling capacity with no increase in power consumption—that's York's sensational Hi-Ef cooling system! New Sealed Air Circuit (exclusive on 3, 5 and 7½ hp. models) keeps motor heat out of cool air flow.

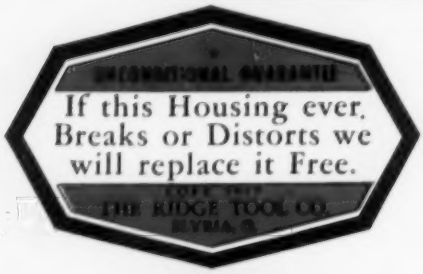
York's hermetically sealed cooling system means "packaged" construction—no field charging, no tubes to run, no field fabrication. There are no expansion valves to get out of order, no gasketed joints—no major service problems that cause profits to go down the drain.

Find out about the *Yorkaire Big 4*—four dynamically new selling approaches that will send your sales and profits soaring! Get in touch with your nearest Yorkaire distributor, or mail the coupon today!

York refrigeration air conditioning

the quality name in air conditioning

Even without this famous guarantee



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would still be the World's Most Popular Pipe Wrench

. . . and no wonder— millions of users know it out-performs, out-lasts all others!

It's the "RIDGID" name that guarantees you everything you want in a pipe wrench—instant bite on the pipe, instant let-go—it can't lock, assured by patented hookjaw suspension . . . handy pipe scale, easy-spin adjusting nut, comfort-grip I-beam handle . . . and every one factory-tested before shipment! Always most for your money . . . your Supply House has them!

You get more quality and more-for-your-money in all RIDGID Pipe Tools.

RIDGID
Work-Saver Pipe Tools

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UNIFORM DUCTILITY OF YOUNGSTOWN PIPE

makes your job easier,
quicker . . . yet more efficient

You may never bend a piece of pipe this way, but if it's Youngstown you can do it. Do it easily, quickly, uniformly. Uniform ductility—one of seven points of uniform goodness in Youngstown Pipe—is worth money to you. Good bendability means faster installation. Better fitting to contours. No work slowdown—no special equipment needed. You'll be hours, dollars and energy ahead, if you depend on Youngstown.

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Youngstown PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices Youngstown, Ohio District Sales Offices in Principal Cities

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WATER SOFTENERS & FILTERS

for Industrial Installations

Hundreds of Bruner Industrial Water Softener installations are proving their superiority in military bases, industrial plants, hotels, hospitals, schools and colleges in all parts of the United States, Canada, Alaska and South America.

Examples of Bruner Industrial Installations:

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University of Missouri — Columbia, Mo.
Peabody High School — Trenton, Tenn.

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Gulf Bay Hotel — Sarasota, Fla.
Athens State Hospital — Athens, O.

INDUSTRIAL
Chevrolet Division GM — Flint, Mich.
Hallo Bros. Dept. Store — Canton, O.
Havana Laundry — Havana, Cuba
General Electric Co. — Bloomington, Ind.

MILITARY
Wright Patterson Air Force Base — Dayton, O.
Big Spring Air Force Base — Big Spring, Tex.

There are Bruner Sales and Engineering offices in principal cities. Your inquiry will receive immediate attention.

Manual and Fully Automatic softeners in capacities up to 1,500,000 grains are carried in stock. Larger capacities and special equipment to treat unusual water conditions engineered to meet your requirements.

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WATER SOFTENERS & FILTERS

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4763 N. 32nd Street • Milwaukee 16, Wisconsin

Sales Offices in Principal Cities • Plants in Milwaukee and Santa Barbara

Main offices and plant of Pratt & Whitney Aircraft, East Hartford, Conn., in which Sarco Heating Specialties are installed. These Sarco products are used by all divisions of United Aircraft Corporation.

35 repeat orders from United Aircraft

for Sarco Heating Specialties!

First installation in 1933. Thirty-five installations since. That's the 22-year record of Sarco Heating Specialties in plants and office buildings of all United Aircraft Divisions.

35 *large* repeat orders... won by Sarco proved dependability!

Several thousand Sarco steam traps and other Sarco Heating Specialties are on the job at:

Pratt & Whitney Aircraft Div., East Hartford, North Haven and Southington, Conn., *Hamilton Standard Division*, Windsor Locks, Conn., *Sikorsky Aircraft Division*, Bridgeport and Stratford, Conn.

For further information on Sarco heating specialties, Sarcotherm weather-compensated control systems for steam and hot water heating, and Sarcofin finned-tube and baseboard radiation, write Sarco Company, Inc., Empire State Building, New York 1, N.Y.

SARCOfin Radiation

...another Sarco product

APPROVED RATINGS—by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

1-YEAR GUARANTEE against defects in materials and workmanship.

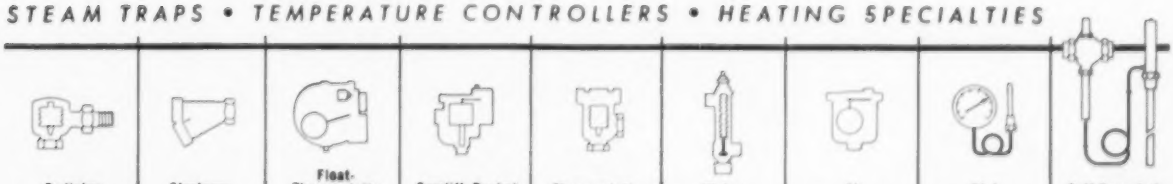
COOPERATION—careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

Write for Bulletins

SARCO

Sarco quality assures satisfaction

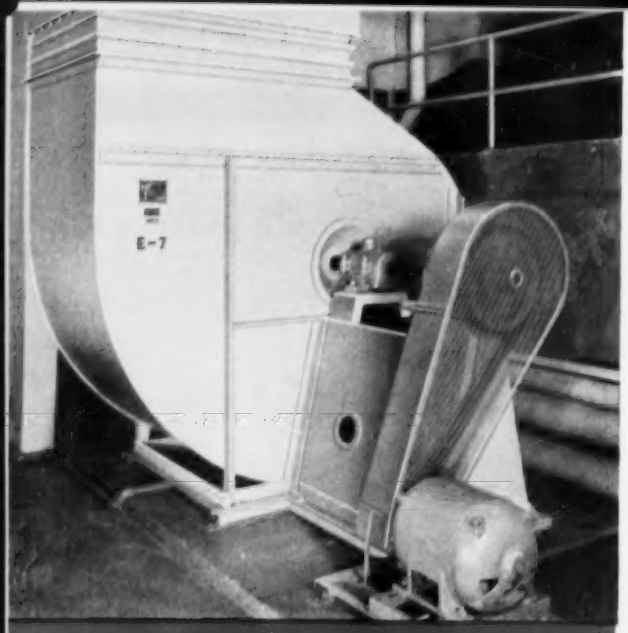
STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES



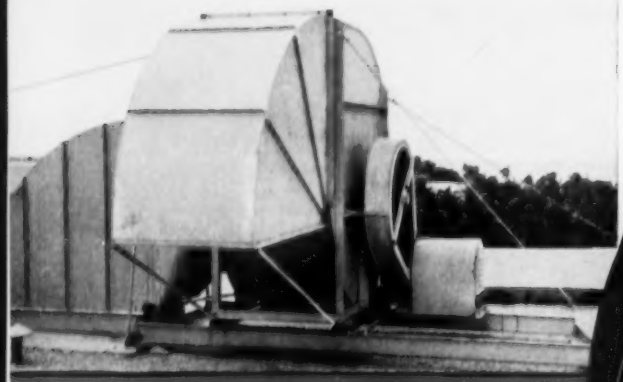
WHY "BUFFALO" BL FANS ARE USED FOR SO MANY OF THE BIGGEST JOBS

Not because of first cost, certainly. We build into "Buffalo" Type BL Limit-Load® Ventilating Fans the characteristics we know they must have to give the best possible service. This refusal to short-cut quality has occasionally cost us some business, but has made "Buffalo" *the* choice for reliability and performance on the job.

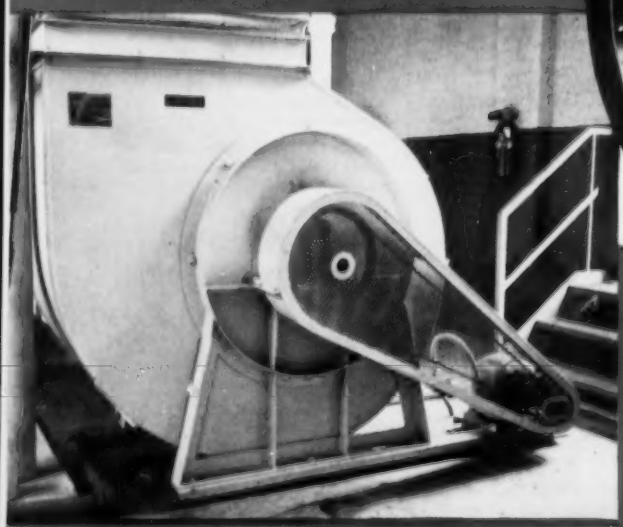
Thus, engineers and contractors appreciate the "Q" Factor* built into these fans. They know the smoothly curved inlet collar with "Buffalo" inlet guide vanes reduces entry turbulence and simplifies the duct connection. They know how smoothly and efficiently the backward-curve-blade wheel and properly proportioned housing handle air. They know that performance is stable from free delivery to shutoff. In short, they know they've done the best by the customer in specifying "Buffalo". Bulletin F-101 gives all details — write for your copy and see why "Buffalo" is in so many of the country's finest and largest installations.



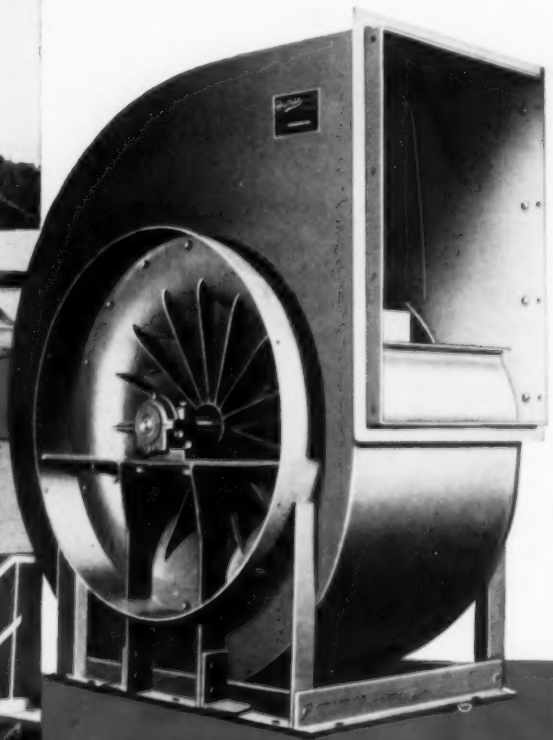
In leading offices and plants



In the finest resorts and hotels



In top stores, banks, hospitals



"Buffalo" Type BL Limit-Load® Ventilating Fan. Capacities to 500,000 cfm.

The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

LEADERS RELY ON LAU

25 Years Building Better Blowers

Special engineering, special manufacturing developments and highest standards of quality have kept Lau ahead for the past 25 years. And now, during our Silver Anniversary Year, Lau continues to set the pace in the air-moving equipment field.

THE TRIUMPHANT TRIPOD

THE LAU BLOWER COMPANY

2000 Home Ave. • DAYTON 7, OHIO

Other plants at Kitchener, Ont., Canada, and Azusa, California

This exclusive Lau-designed and patented bearing bracket didn't just happen! The problems of strength, rigidity, positioning, alignment and permanent attachment all had to be reckoned with. And there had to be a minimum impediment to air flow inlet. Our Bearing Bracket insures concentricity of shaft and wheel to blower housing. It's a three-point suspension "tripod" design. It is positively attached to the scroll side by *both* mechanical lock and spot welding. It's superior to any other on the market. Another example of *why* Lau Builds Better Blowers. Ask us how we might handle your air handling problems, write Dept. M.

LB-4, 56

SERIES "A" BLOWER | ELECTRO-WHEEL BLOWER | LAU-PAK BEARING | SERIES "A" WHEEL | WELD WHEEL | LAUSTEEL PULLEY | BEARING BRACKET | PANEL FAN | RANCHER FAN

WORLD'S LARGEST MANUFACTURERS OF AIR-CONDITIONING BLOWERS

THE GREATEST

The new Quiet-Tested Roof Exhauster design carries out the same graceful low contour lines so popular in all Jenn-Air Aluminum Exhausters. U-Spring Cushion Suspension Mounting eliminates the transmission of vibration and motor hum to the base of the unit, thus achieving a quietness never before possible. Patents pending.

"Ratings in accordance with standard test code by the Texas Experiment Station"—determined in accordance with procedures as set forth by NAFM and ASH&VE.

A graphic portrayal of what U-Spring Cushion Suspension Mounting can do in eliminating vibration. Note the silver coin standing on the base of the Unit. There is absolutely no evidence of vibration transmission.

ENGINEERING ADVANCE IN POWER EXHAUSTERS SINCE LOW CONTOUR DESIGN

NEW JENN-AIR

Quiet-tested

ROOF EXHAUSTER

WITH U-SPRING CUSHION SUSPENSION MOUNTING

Here's a new "hush-hush" product that *isn't* being guarded against discovery . . . in fact, Jenn-Air unwraps its exclusive Quiet-Tested Roof Exhauster for all to see . . . *NOW*. It is hailed as the most significant engineering advance in power exhausters since low contour design—a Jenn-Air First. Now, for the first time, a power exhauster is offered that's truly quiet.

U-SPRING CUSHION SUSPENSION MOUNTING CUTS VIBRATION—LOWERS NOISE LEVEL

A new principle of power assembly mounting is introduced in this new Jenn-Air Exhauster. U-springs suspend the power unit so it is cushioned against vibration . . . an exclusive Jenn-Air feature. New design in fan blade and housing reduces air velocity. In addition to the usual dynamic and static blade balance, a further critical test is made . . . the motor and blade are balanced together . . . another Jenn-Air exclusive. *All this adds up to the lowest noise level ever achieved in power exhausters.*

EVERY QUIET-TESTED EXHAUSTER INDIVIDUALLY CHECKED BY EXCLUSIVE VIBRONIC EYE

Every Quiet-Tested Unit is individually checked under simulated operating conditions by the exclusive Vibronic Eye in a sound controlled room. It works this way. First, a standard of acceptable quietness is established . . . then the Vibronic Eye tests every exhauster for vibration and noise. A further test is made for motor load and insulation break-down. Those are examples of the ceaseless search to improve products by Jenn-Air. So, look to Jenn-Air for better engineered exhausters —designed and line tested to perform beyond any in the field.

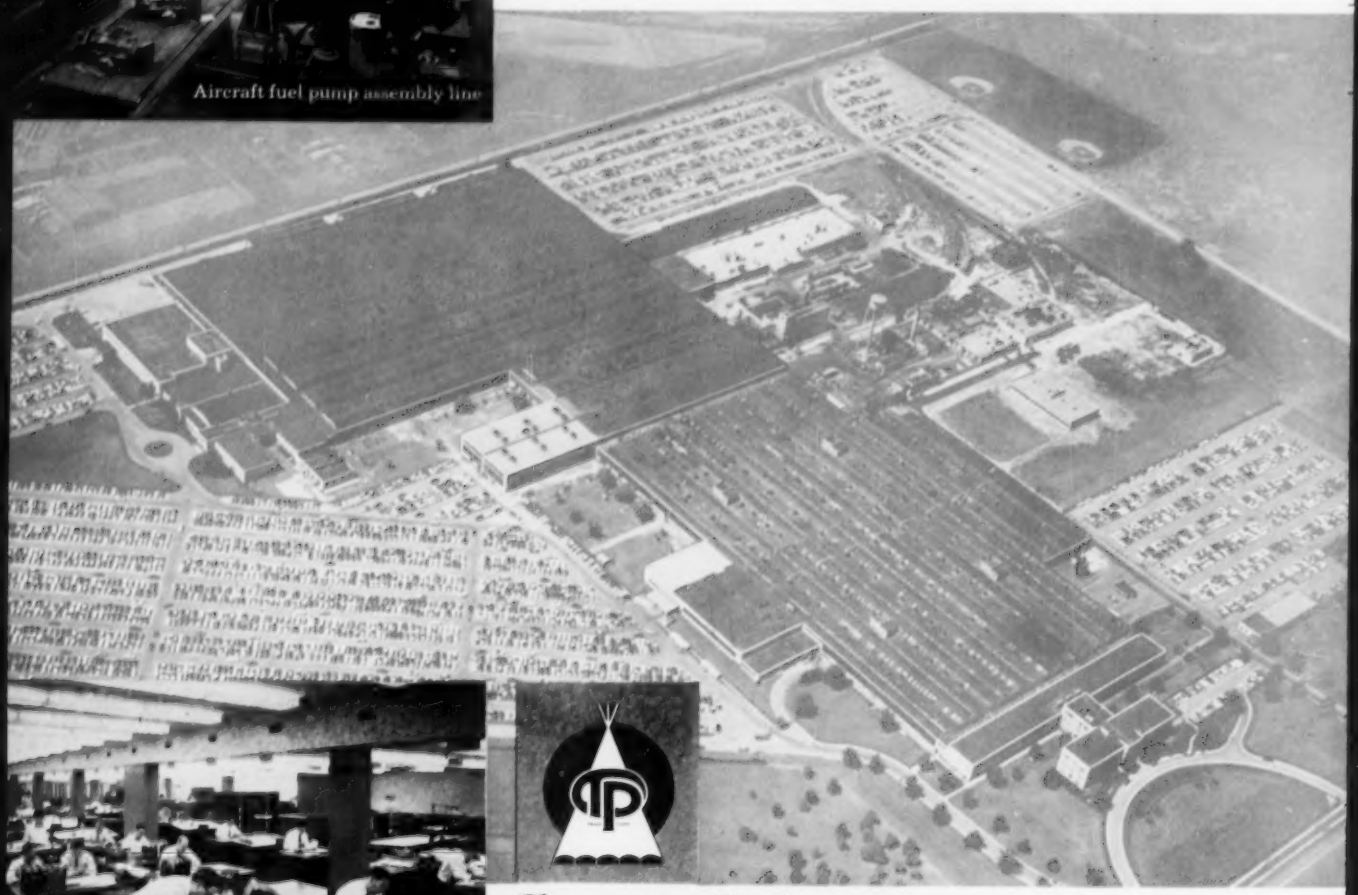
JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive
Indianapolis 7, Indiana

Jenn-Air Exhausters on production line moving up for testing. Every Unit is line-lab tested for vibration, sound, motor load and insulation break-down before leaving the plant.

Here is the Vibronic Eye test chamber along the production line. Through the window is shown a Quiet-Tested Exhauster which has just moved into position for testing. This final check eliminates the element of human error.

Thompson Products, Inc.

Aircraft fuel pump assembly line



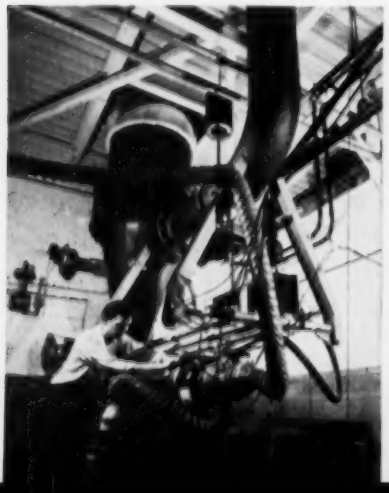
Air conditioned Engineering office

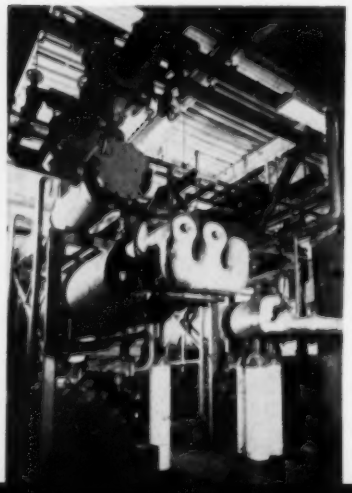
Thompson Products, Inc. TAPCO PLANT, Cleveland, Ohio

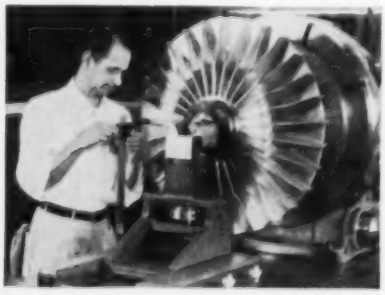
One of the 16 Factories owned by this pioneer manufacturer of Automotive, Aircraft, Industrial and Electronic Products.

POWERS CONTROL is used in the majority of Thompson factories. In TAPCO plant, Administration and Engineering offices, production areas, research laboratories and test cells, cafeterias, CRAWFORD HALL auditorium and some processes are equipped with Powers temperature and humidity control.

Below: Installation for testing turbine drives





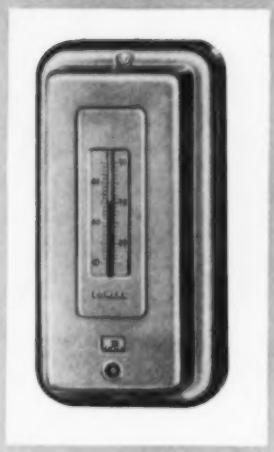


Above: Index head for inspection of vane wheels

Left: Refrigeration system for cooling test fuels

increases production...lowers costs...

with POWERS *Systems of Temperature, Humidity & Ventilation Control*



OTHER PROMINENT POWERS USERS
Aluminum Co. of America
American Telephone & Telegraph Co.
Bendix Aviation Corp. • Chrysler Corp.
Douglas Aircraft Co.
E. I. DuPont de Nemours Co.
Ford Motor Co. • General Motors Corp.
General Electric Co.
B. F. Goodrich Tire & Rubber Co.
Johns Manville Co. • Parke Davis & Co.
McDonnell Aircraft Corp.
Radio Corp. of America
Standard Oil Co.'s of N.J. and Ohio
U.S. Rubber Co. • Zenith Radio Corp.

In Thompson's TAPCO plant, production of high-quality precision products is aided by Powers control in production and assembly-line areas; test and research laboratories; administration and engineering offices.

Comfortable, Even Heat at the Right Temperature for each space or department helps increase efficiency of employees and results in these money saving advantages:

- **Increased Production.** Thermal comfort helps employees increase output and maintain production schedules.
- **Better Quality Products,** fewer rejects, better workmanship, more uniform quality.
- **Cuts Heating Costs Up to 25%.** Powers Control Systems prevent OVER-heating and stop waste of fuel. Steadily advancing fuel costs make this an important advantage. Lower heating costs alone pay a big return on the investment in Powers automatic control.

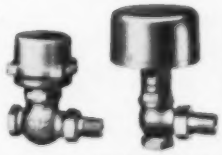
Powers Control Systems Perform Better and Last Longer. Year after year users report 25 to 40 year old Powers control systems still giving dependable regulation. When you make a major investment in a control system select one with a time proven record for long life, low operating and maintenance cost. Specify and install Powers.

Consult Powers on Space Heating or Process Control. If you have a temperature or humidity control problem, contact your nearest Powers office. Our experience gained in thousands of buildings and processes may save you time and money.

Some of the many components used in a Powers pneumatic control system

FLOWRITE
Control Valve

POWERSTROKE
Piston Operators for dampers



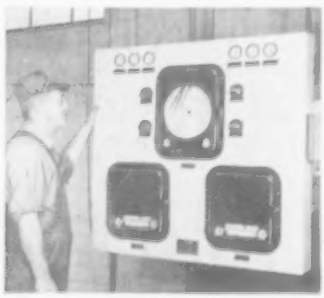
LIMITEM Thermostat for air temperature in ducts and processes.

POWERS PACKLESS Control Valve—Their duo-seal construction reduces valve stem friction, eliminates packing maintenance and leakage of water or steam and gives smooth accurate control.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

Over 65 years of Automatic Temperature and Humidity Control



(E-62)

How to kill three duct problems

with one insulation . . .

Thermal, acoustical and vapor barrier problems are "dead ducks" when you use ULTRALITE*, the long glass fiber insulation. Here's why: Due to its unique long glass fiber composition, ULTRALITE is the toughest, most resilient glass fiber insulation on the market, with a record of ten years of successful application. Because of this extra strength, it can be adhered to sheet metal and run through the brakes and shears at the same time the ducts are formed — without worry that it will tear, compress, or delaminate.

Ducts formed in this way are *completely insulated units*, ready to install on the job. They solve the noise problem without impairing the efficiency of the unit because ULTRALITE Duct Liner has a low air friction coefficient. The same insulation that soaks up objectionable sound also insulates the ducts against heat gain or loss. *No vapor barrier is necessary;* with the insulation on the *inside* of the duct, the duct itself becomes the vapor barrier.

Try this time-saving new method on your next job, and you'll be delighted with both cost and performance. But be sure to use ULTRALITE — the only flexible glass fiber insulation with a 10-year record of successful performance.

*Reg. U. S. Pat. Off.

NOTE

Should you continue to wrap ULTRALITE around the exterior of ducts for thermal protection, be sure to line the plenum and short supply and return ducts with ULTRALITE Duct Liner. Do so even on jobs where duct liner is not specified, and you will be well repaid, for this will make all the difference between an enthusiastic and a dissatisfied customer.

ULTRALITE is stocked locally in 57 cities. Your nearby distributor is listed in the Yellow Pages under "Gustin-Bacon Insulations."

GUSTIN-BACON *Manufacturing Company* GUSTIN gb BACON

Thermal and acoustical glass fiber insulations • Pipe coverings and fittings • Railroad gaskets and supplies

220 W. 10th St., Kansas City, Mo.

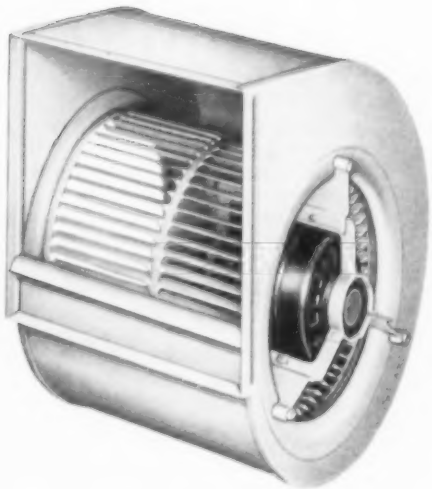
SILENT

BLOWHARD

"BIG BOY" DIRECT DRIVE BLOWER FOR HEATING-COOLING COMBINATIONS

Theme of the thinking at Utility might be expressed: "Make it blow – Make it better – Keep it quiet!" Direct beneficiaries of this policy are manufacturers of heating, cooling, refrigerating and ventilating equipment. Newest visible expression of this passion for silence is a burly brute of a direct drive blower. "Big Boy" is its name. Strength and silence will be the cornerstones of its fame.

Its giant airflow capacity is great enough to handle up to 125,000 BTU – 3-ton heating-cooling combinations. Compact and easily speed controlled, it delivers approximately 1,400 to 1,500 CFM at a static pressure of 0.75" WG to make "Big Boy" the most powerful direct drive blower now available, bar none.



First to create silent direct drive blowers with Neoprene hubs, Utility again is *first* with a direct drive blower of this capacity with super-quiet split capacitor motor. It makes sense to add the sales appeal of whisper-quiet operation to your larger equipment, so specify Utility's silent "Big Boy" Direct Drive Blower.

Check Utility for blowers, blower parts or any combination of parts. Here's what you'll discover:

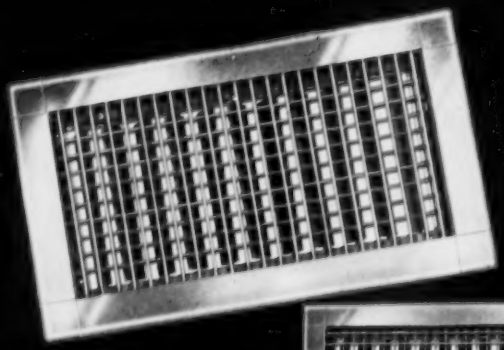
YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE!

A DIVISION OF UTILITY APPLIANCE CORP.

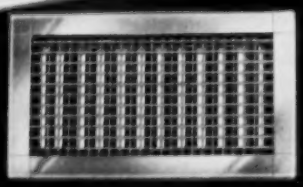
UTILITY FAN CORP.

911 East 59th Street, Los Angeles 1, California

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.



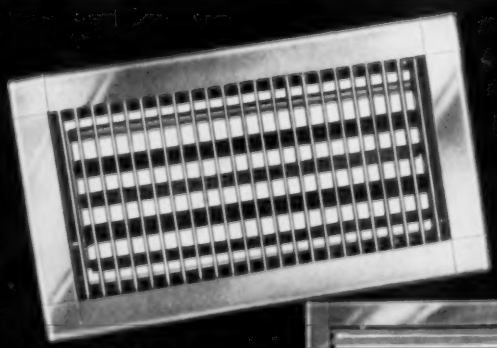
No. 92VHV — vertical front bars, horizontal second bank bars, vertical louvers.



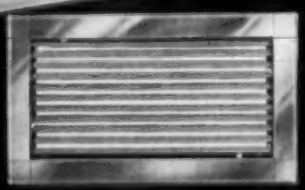
No. 92HVV — horizontal front bars, vertical second bank bars, vertical louvers.

MEMO:

For precise Heating and Cooling control, specify H&C registers and grilles in commercial installations.



No. 93V Register . . . vertical front bars set straight, horizontal louvers.



No. 94A Grille . . . horizontal face bars set at 22° angle for up or down deflection.

H&C TRIPL-AIRE

. . . designed to provide any air-flow pattern you require. Here's the basic line that includes 260 possible combinations of capacity and deflection characteristics. Twenty-six standard sizes, up to 36" x 12" . . . each available in ten variations to provide almost any imaginable combination of deflections in both horizontal and vertical planes . . . plus all intermediate sizes up to 36" x 36" available on order. Face bars and louvers are both adjustable from the front of the register, and opposed louvers permit absolute volume control with equal air distribution over entire face. Finished in top quality enamel . . . modern "Decorator Grey" standard. Get complete details from your H & C Jobber, or consult our current catalog.

H&C FIXT-AIRE

. . . matching return air registers and grilles. Perfect companions to the TRIPL-AIRE line, these FIXT-AIRE units are matched in quality, design, and finish. Registers feature the same positive volume control with opposed louver construction, and have a single bank of face bars in fixed vertical or horizontal position. Grilles are available with horizontal face bars set at 22° angle for up or down deflection where desired. Maximum one-piece size: 36" x 30".

COMPLETE CATALOG AVAILABLE

. . . with full engineering data . . . if your jobber can't supply you, write direct.

HART & COOLEY MANUFACTURING CO.

Dept. 2-AC HOLLAND, MICHIGAN

Beth-Co-Weld pipe is used for the heating and plumbing lines at Kennedy Courts, a recently completed apartment development for 400 families at Fort Dix, N. J. *Plumbing and Heating Contractor:* Thomas F. Laverty, Riverside, N. J.; *Jobber:* Fleck Company, Camden, N. J.

Apartment Project at Fort Dix ... Laboratory at Naval Shipyard

Both Have Beth-Co-Weld Piping

Wherever there's new construction going on, there's an excellent chance you'll find Beth-Co-Weld steel pipe being used for plumbing and heating lines, boiler-room piping, and for sprinkler installations.

Beth-Co-Weld is ideal for general-purpose piping. It is made from sound steel by the continuous-weld process. Besides, Beth-Co-Weld is good pipe to work.

Most jobbers carry Beth-Co-Weld in sizes from ½ in. to 3 in., standard-weight and extra-strong, and in 21-ft lengths, plus or minus 1 in. They also carry Beth-Co-Weld in 3½ in. and 4 in. sizes, standard-weight only.

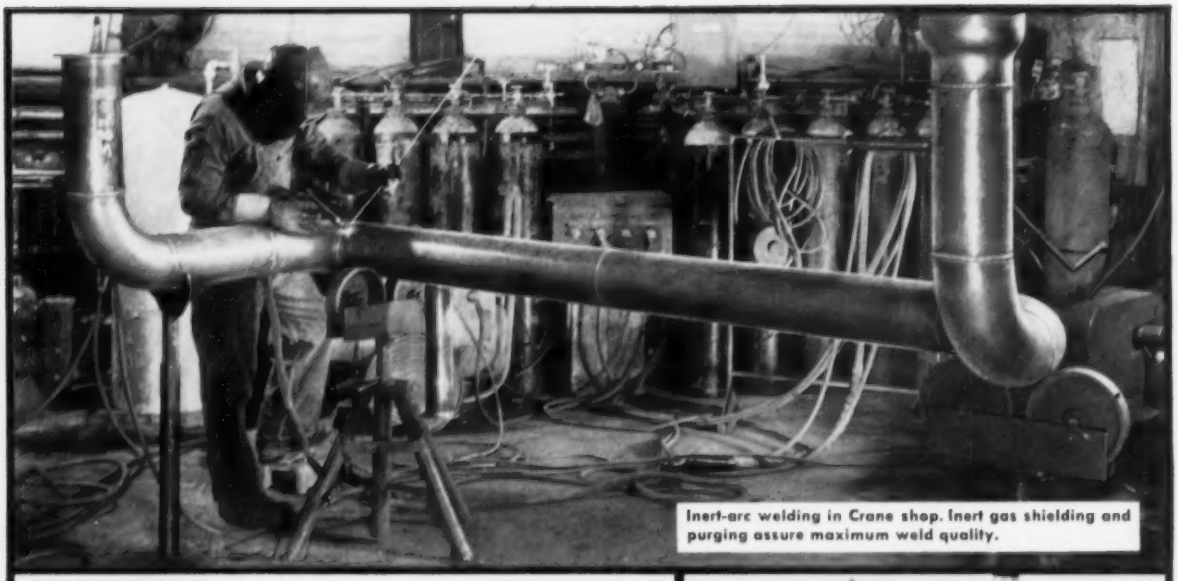
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

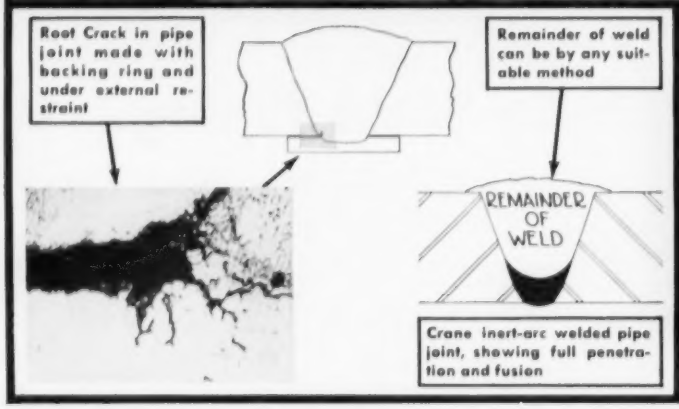
BETHLEHEM STEEL

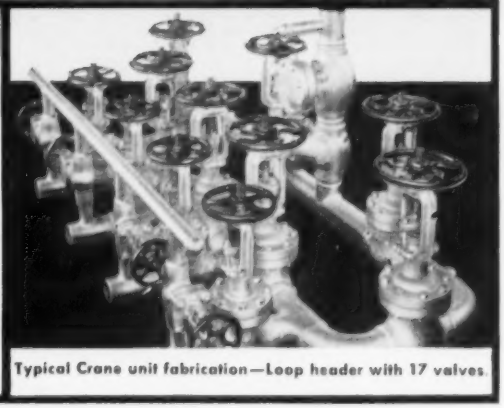
BETHLEHEM STEEL

A network of Beth-Co-Weld pipe, ranging in diameter from ½ in. up, is used in the new Radiological Defense Laboratory, built for U. S. Navy Bureau of Yards and Docks at San Francisco Naval Shipyard. *Mechanical Contractor:* Anderson and Rowe; *Jobbers:* Heieck and Moran, and P. E. O'Hair—all of San Francisco.



Inert-arc welding in Crane shop. Inert gas shielding and purging assure maximum weld quality.


Root Crack in pipe joint made with backing ring and under external restraint
Remainder of weld can be by any suitable method
REMAINDER OF WELD
Crane inert-arc welded pipe joint, showing full penetration and fusion



Typical Crane unit fabrication—Loop header with 17 valves.

Crane-developed butt-welding technique assures more efficient process piping

Gives important advantages—eliminates backing rings

On shop fabricated assemblies, Crane inert-arc *first pass* welded butt joints are making significant contributions to modern process plant operation.

By eliminating backing rings as used with metal-arc welding, the Crane inert-arc first pass technique assures a high quality weld with smooth root contour without crevices and eliminates the possibility of basal cracks sometimes associated with backing rings or the characteristics of the base material.

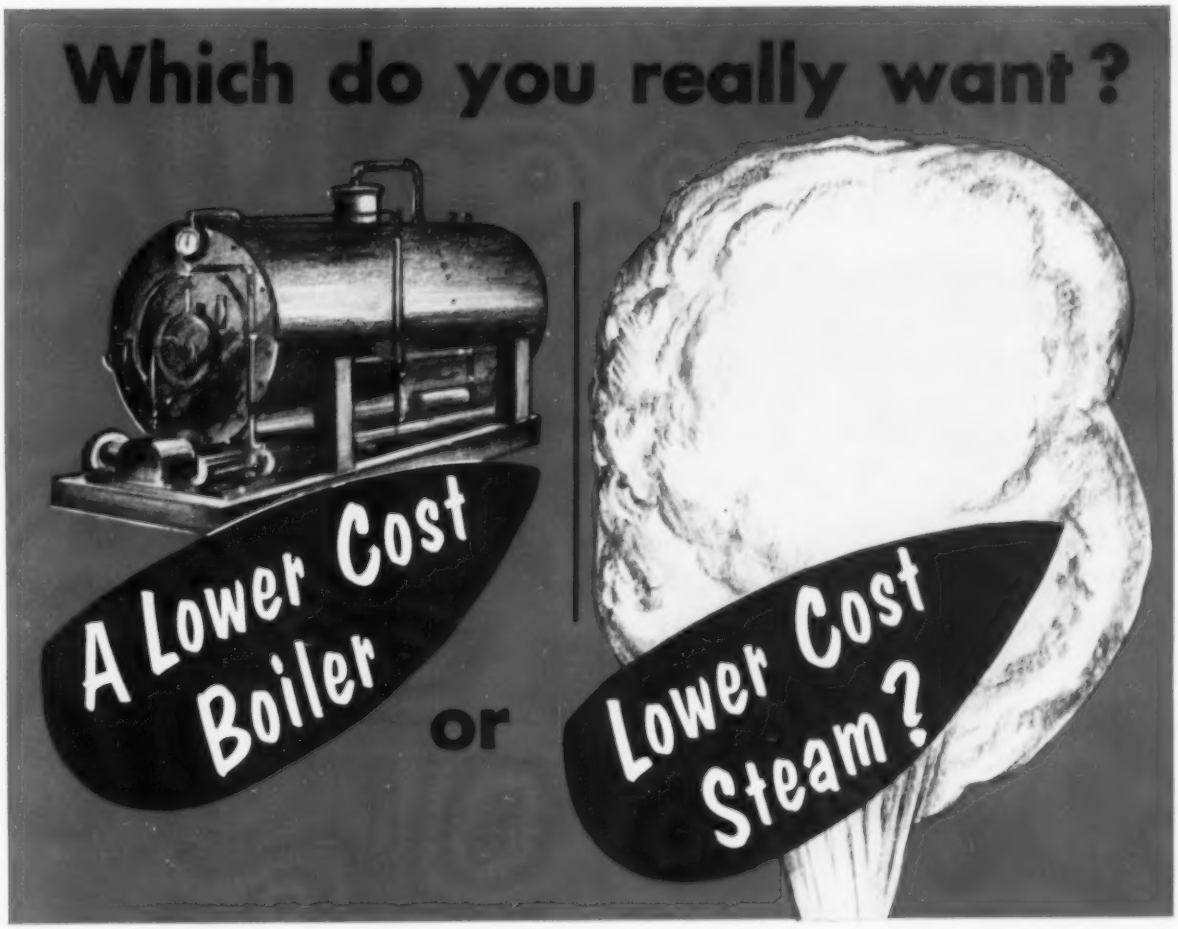
The practicability and dependability of Crane inert-arc *first pass* welding have been thoroughly demonstrated. Leading process plants have been enjoying its advantages for several years. One installation involved many carloads of alloy fabrication in which all welds were inert-arc type.

Welding all types of stainless, nickel, Monel, Hastelloy "B" and other alloy piping is just one of Crane's services to the process industries. Crane handles every phase of unit fabrication for manifolds, assemblies and valve groupings—simple or complex, large or small. Your local Crane Representative can give you valuable assistance on all your process piping needs—or, write Crane at the address given below. No obligation.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas



A word about price vs. cost

When you come right down to it, a boiler is only as "cheap" as the results it gives you! A low-cost boiler that's unreliable or incomplete is the most expensive one on the market.

That's why we've always built AMESTEAM GENERATORS up to a standard, not down to a price. Throughout our 108 years of building boilers, this policy has paid off in lower-cost steam for Ames customers. It is no coincidence that so many firms specify "AMESTEAM" on the strength of its reputation for reliability and economy of operation. Ames customers are invariably "repeat" customers! They know that lower-cost STEAM rather than a lower-cost boiler is the best buy.

AMESTEAM GENERATOR

20 sizes, 10 to 600 h.p. 15 to 200# Oil, Gas or Oil-Gas Combination.

MAIL COUPON TODAY

AMES IRON WORKS INC.
BOX D-46 OSWEGO, N. Y.

AMES IRON WORKS
BOX D-46, OSWEGO, N. Y.

Gentlemen:
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Here's What We're Doing in FABRICATION

SPINNING
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FINNING
COILING
EXPANDING
DRILLING

What are You Doing?

MAKING

FIRE EXTINGUISHERS?

TROMBONES?

DOOR CLOSERS?

Let's Get Together!

Regardless of the type of product you manufacture—if it is made from tubing and requires fabrication—Wolverine Tube can help you do a better job.

Wolverine's fabrication equipment is complete and is backed by nearly four decades of metalworking experience. Supposing, for example, that your product requires a partially or completely closed tubular part. You'll find the right answer to this one in Wolverine's unique Spun End Process*.

Spinning the ends of the tube in special dies, Wolverine, in one easy operation, imparts a wide variety of contours with fully or partially closed end treatments.

Then, too, there are many other Wolverine fabrication techniques; spinning, finning, bending, coiling, flaring, expanding, beading, drilling, piercing. Specify the one that fits your needs. In each case, you'll find that Wolverine Tubemanship—the combination of rigid quality control, years of experience, constant research and sound engineering—is your assurance of quality and satisfaction designed to meet your most exacting requirements.

Wolverine is also a leading supplier of both finned and prime surface tubing. Its products and services are available in copper, aluminum and their alloys. Your Wolverine salesman is as near as your telephone, ready at all times to help you with tubular problems and applications. Write, too, for your copy of Wolverine's Fabricated Parts Catalog.

Wolverine Tube, 1461 Central Ave., Detroit 9, Mich.

*A PATENTED PROCESS. RE. 22485

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WOLVERINE TUBE

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Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

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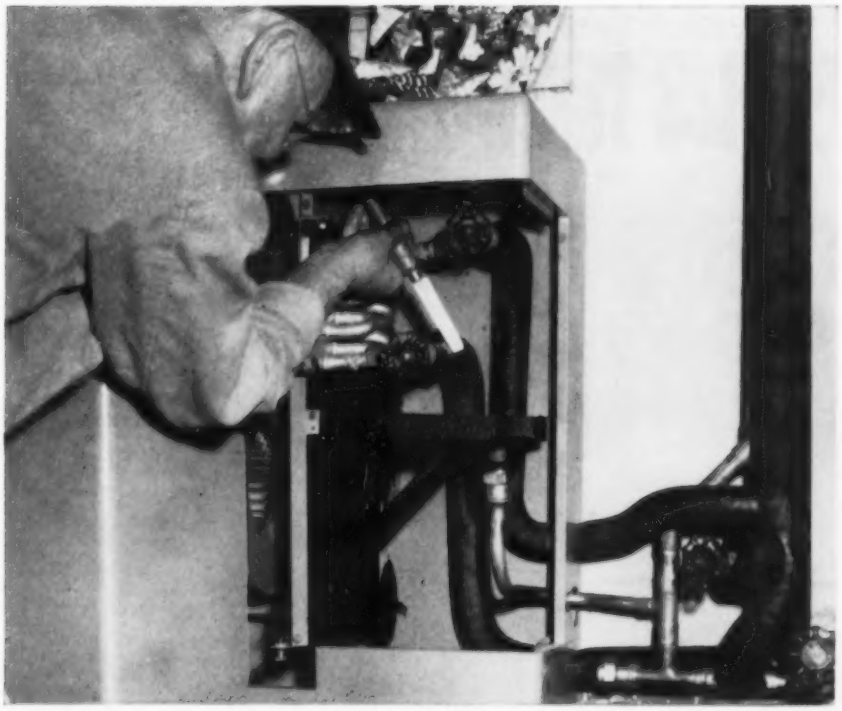
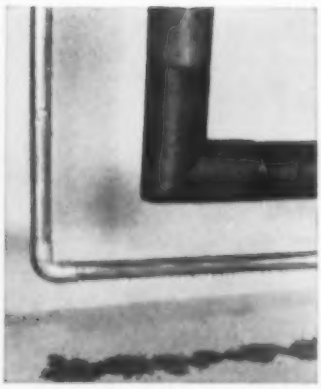
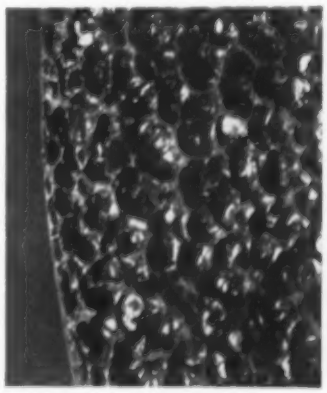


Neat and easy to apply, Armaflex can be slipped on pipes in one simple operation. If lines are already installed, slit Armaflex lengthwise, snap in place and seal with Armstrong 520 Adhesive.



No condensation under normal design conditions on indoor lines operating as low as 32° F., when you use ½" thick Armaflex. Vaporproof composition keeps material positively dry.

Self-extinguishing Armaflex can be installed on copper tubing, held back with clamps while fittings are being sweated, then slipped into place.



Completely vaporproof, Armaflex is made up of uniformly sized foamed plastic cells that seal out moisture and air, give Armaflex its low K-factor of 0.28 at 75° mean temperature.

New insulation for liquid cooling lines

stops dangerous condensation

Stop condensation on liquid cooling lines positively and lastingly with Armstrong Armaflex*, a new, flexible pipe insulation.

Closed cellular structure and vaporproof composition completely seal out air and moisture. No separate vapor barrier is needed. Insulating efficiency stays high because Armaflex stays dry.

Great flexibility makes Armaflex remarkably easy to install. It can be slipped over pipes and tubing, following contours without cutting or fitting; or slit and snapped over pipes. The only sundry used is Armstrong 520 Adhesive for cementing joints. Fittings can be insulated with miter-cut covers. Armaflex is clean to work with. It will not rub off, crumble, or chip. There's practically no waste. Self-extinguishing feature allows fittings to be sweated with Armaflex on lines.

Armaflex comes in 6' lengths, for pipes and tubing to 3⅛" i.d. It can be used on lines operating from 32° to 200° F.

Free booklet with all details sent to you on request. Write for "Armstrong Armaflex, a Flexible Pipe Insulation," to Armstrong Cork Company, 2004 Sherman St., Lancaster, Penna.

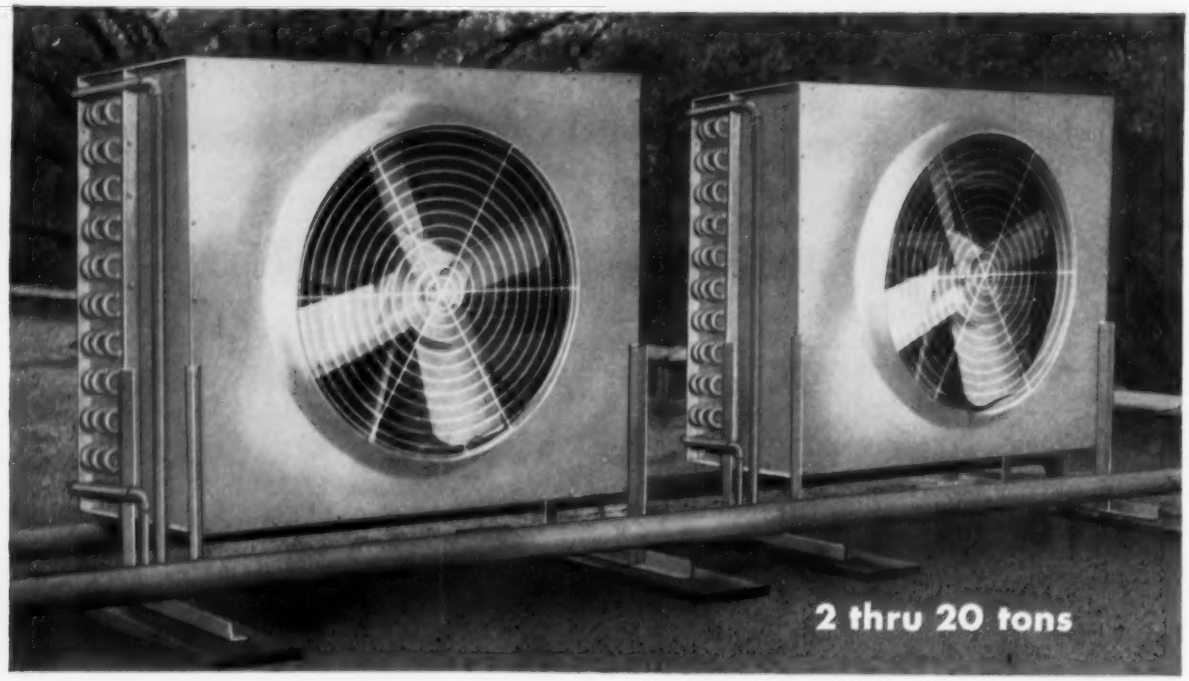
Armstrong

INDUSTRIAL INSULATIONS

*TRADE-MARK

So Halstead & Mitchell Engineers said:

"LET'S GIVE THIS INDUSTRY A BETTER AIR-COOLED CONDENSER"



Now we proudly call to your attention the Halstead & Mitchell Air-Cooled Condenser for waterless air conditioning and refrigeration. This is today's *better* remote Air-Cooled Condenser.

It is engineered to a new principle called "Co-ordinated Design," and this is engineering pioneering which has coordinated capacity, performance, structural design and appearance to give:

1. Extra-Safe Capacity Ratings — made possible by a unique "dimpled" fin *giving 15% added heat transfer*, as well as a core designed for higher air volumes at lower fan speed.

2. Extra Years of Working Life — insured by exclusive, proven Halstead & Mitchell protection against corrosion; lifetime ball bearings; and a tubing assembly pattern which is self-reinforcing and thus deadens vibration before it starts.

3. Extra-Quiet Operation—which is the direct result of deep-pitch fan blades driven at slow speeds.

4. Extra-Easy Multi-Circuiting—developed for Halstead & Mitchell remote Air-Cooled Condensers by engineers who know what simpler manifolding and selection of circuits can mean when several air conditioning and refrigeration machines must work off a single coil.

Even more important, you know these Air-Cooled Condensers bring you—with their Halstead & Mitchell nameplate—an assurance of the highest quality in the industry. Whether you are jobber, contractor, architect or manufacturer (and we'll be pleased to give quantity quotations), order Halstead & Mitchell "Co-ordinated Design" for *the better Air-Cooled Condenser.*

WRITE FOR BULLETIN AC-100

Halstead & Mitchell

BESSEMER BUILDING, PITTSBURGH 22, PA.

Manufacturer of THE INDUSTRY'S WIDEST SELECTION OF COOLING TOWERS

World's Largest Manufacturer of WATER-COOLED, CLEANABLE CONDENSERS

AT LAST! what the industry has been waiting for!

ALCO'S NEW Venturi-Flo distributor . . .

The new ALCO venturi distributor assures equal refrigerant distribution to all passes of a multi-circuit evaporator with a low-pressure drop.

works in any position
vertical, upside-down or horizontal.

wide application range
from 25% of capacity to 150% of rated capacity . . . with only a small pressure drop at maximum conditions.

low-pressure drop
allows closer and more economical thermo-valve sizing.

one-piece construction
no nozzles for capacity regulation . . . nothing to take apart, nothing to come apart.

engineered—for service for life

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directs air right where it's needed — prevents see-thru. Solid section, all aluminum.

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Completely Adjustable

OUTLET GRILLE

FOR CEILING and SIDEWALL INSTALLATIONS

Here's the newest development for efficiently controlling the diffusion of forced air. It's the first truly "convertible" ceiling and sidewall diffusion grille . . . *THAT'S EQUALLY EFFICIENT WHEN HANDLING EITHER COOLED OR HEATED AIR.*

Greater free area and ***individual louver adjustment*** make this amazing performance possible.

Installation requires less labor. Requires no unhandy equipment to convert from cool to heated air. Just a simple matter of moving the louvers. Equally adaptable to old or new installations.

Mail the coupon today and learn how the new Titus "Series 200 Outlet Grilles" can *help you save money on every installation requiring sidewall or ceiling diffusion.*

New FREE CATALOG

TITUS MFG. CORP. • Waterloo, Iowa

Gentlemen: Please rush me FREE catalog on new TITUS CEILING AND SIDEWALL OUTLET GRILLES which are creating a new design trend.

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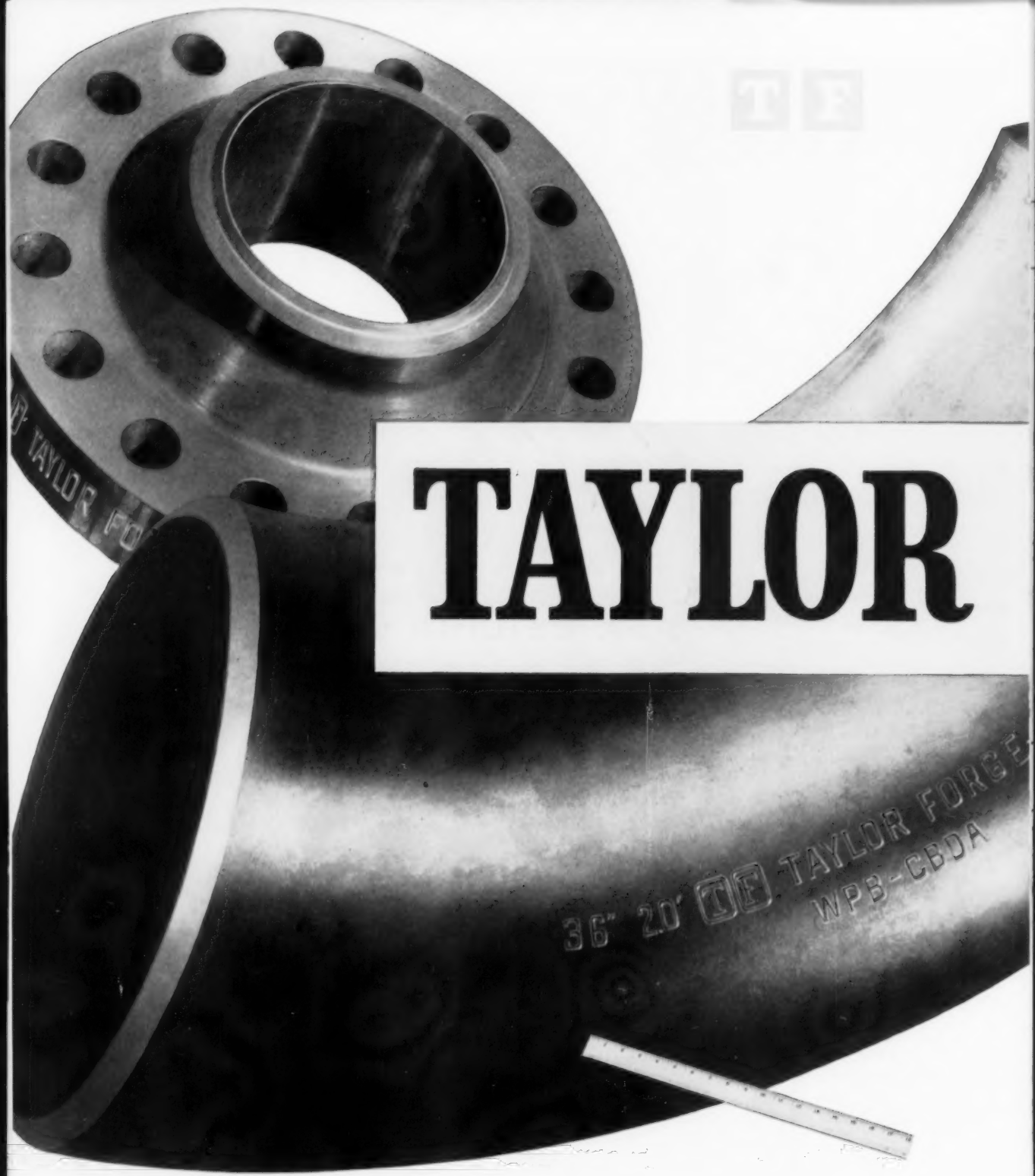

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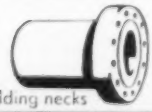
Welding necks

For Utmost Safety...
Complete Satisfaction...
Unexcelled Service...

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Welding Fittings and Forged Flanges

* Extra quality

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* Meet all American Codes and Standards

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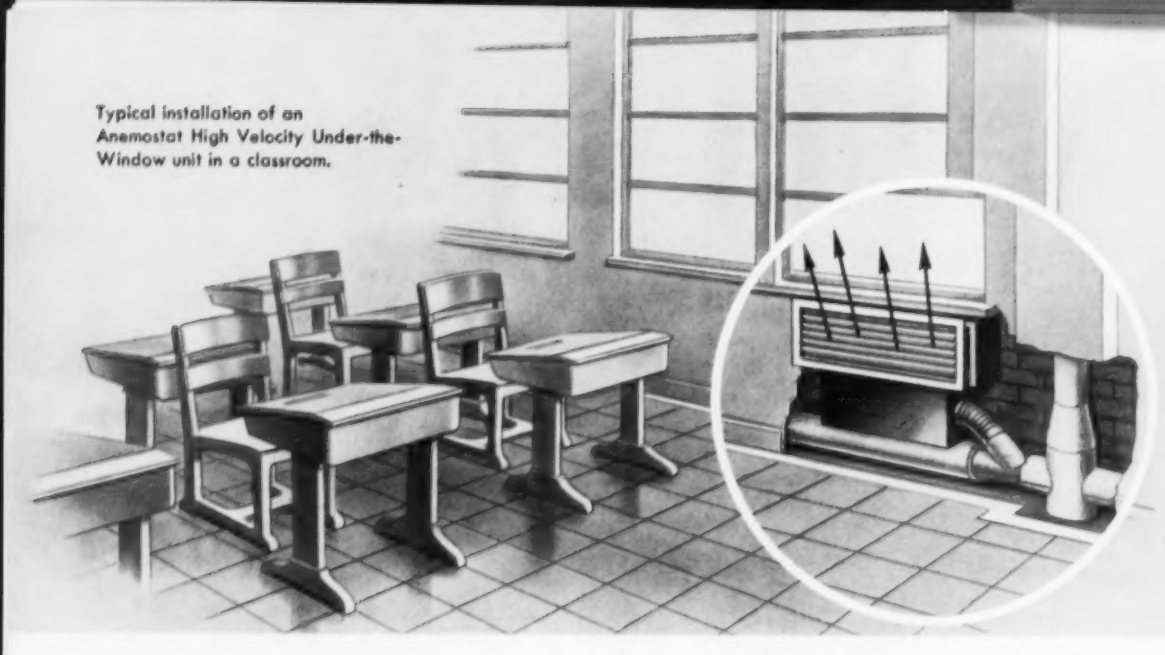


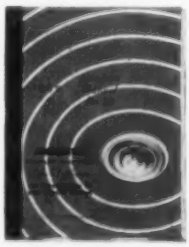
Typical installation of an Anemostat High Velocity Under-the-Window unit in a classroom.

How to deliver high velocity air to schoolrooms

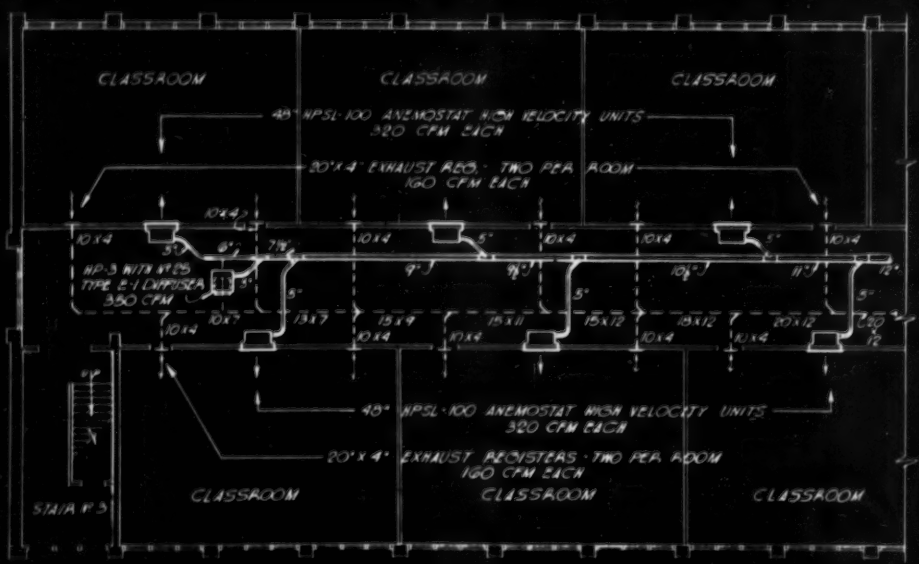
Shown here are two ways of using the Anemostat All-Air High Velocity system of draftless air distribution for heating and ventilating schools. Under-the-Window units (above) are the most practical for colder climates. Corridor distribution (below) is preferable in warmer climates.

Advantages:

- All-Air High Velocity units require smaller than conventional ducts, thus save space and money.
- All-Air HV units can be used for individual or zone control, in single or dual duct installation.
- Since air is supplied from the main equipment room, there is no need to break through the outside of the building for prime air make-up. This eliminates grilles, dampers, possibility of leaks.
- The Anemostat All-Air HV system can be simply installed by the sheet metal trades. No supply or return pipes are required. Units are quiet, need a minimum of maintenance from custodians.



For latest data on All-Air High Velocity units, write on your business letterhead for new Selection Manual 50 to Anemostat Corporation of America, 10 E. 39 Street, New York 16, N. Y.



Diagrammatic layout shows corridor distribution of high velocity air for wing of school.

There's no "*or Equal*" when you select...

BUSH

Air Conditioning Units

EXCLUSIVE INNER-FIN DESIGN • THE INDUSTRY'S MOST COMPLETE LINE

'AH' AIR HANDLING UNITS

Available in 12 models from 800 CFM to 28,800 CFM. Floor-standing vertical and ceiling-hung horizontal models with direct expansion, water or steam coils. Face and by-pass damper sections, mixing boxes, spray type humidifiers and filter sections available for all units. Models AH-10 to AH-32 available with *Inner-Fin* coils.

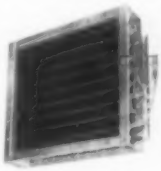
'MZ' MULTIZONE UNITS

Available in 9 sizes covering a range from 2,560 CFM to 28,800 CFM. Multizone Units parallel the standard Bush HAH Air Handling units, using the same proven blower sections and accessories such as filter sections and mixing boxes. Zone dividers may be arranged as desired — vertical, horizontal or a combination of both. Entire interior is well insulated and undercoated. Units can be shipped sectionally when this is desired to facilitate installation.

The BUSH line of air conditioning equipment includes units of all types to meet your every requirement. For single-source simplicity, select quality-constructed, advanced design BUSH units. And for capable engineering or specifying assistance, contact your BUSH sales engineer.

'CR' REMOTE AIR CONDITIONING UNITS

Provide quiet, economical year 'round air conditioning for all types of multi-room buildings. Units are available in vertical floor and horizontal ceiling models . . . feature individual room control . . . are easily incorporated in new or existing buildings.



'IDX' INNER-FIN AIR CONDITIONING COILS

Available in standard stock sizes 2, 3, 5 and 7½ tons for simplified selection. Inner-Fin construction permits use of smaller size coil for any desired capacity. Shallower depth requires less fan horsepower. Coils completely flanged for easy installation.

DX WATER AND STEAM COILS

Bush Water, Steam and DX Coils are supplied in standardized and matched sizes. Singly or in combination, can be arranged to fit practically any installation. Constructed of collar spaced serrated aluminum fins bonded to copper tube, staggered in direction of air flow.

'CC' COMFORT CONDITIONERS

Engineered and constructed for use in the conditioned area. Motors mounted inside casings. Attractive insulated cases, noiseless operation. Available with direct expansion coils of Inner-Fin construction. Where steam coils are desired, inner tubes of DX coil are specially circuited. Water cooling or heating coils also available.

Request Catalogs containing complete specifications on units shown.

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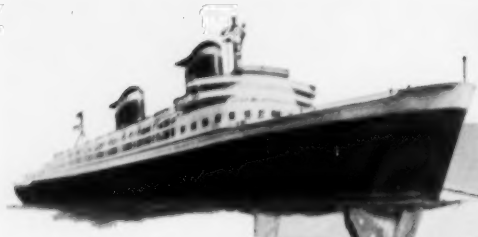
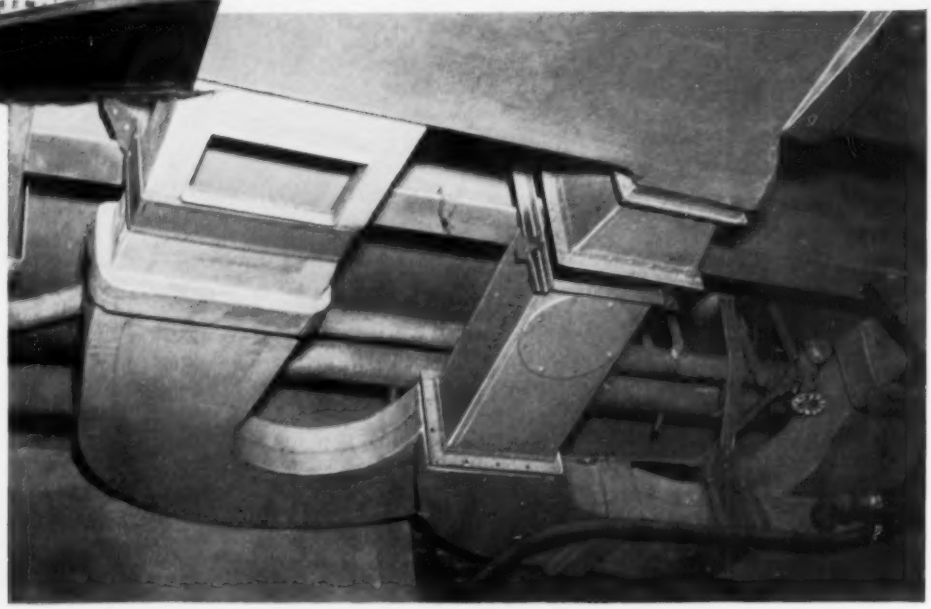


On the air conditioning ducts aboard the S.S. United States . . .



These Spintex insulated ducts are a vital part of the 65 air conditioning systems that honeycomb the new superliner S. S. United States.

NEW J-M *Spintex* INSULATION CONSERVES FUEL AND POWER

MILES OF DUCTS . . . a vital part of the 65 air conditioning systems that honeycomb the S. S. United States . . . are insulated with Johns-Manville Spintex. This insulation was selected because it makes possible maximum passenger comfort at minimum operating cost.

Low thermal conductivity . . . plus resistance to moisture, fire, rot and mold growth . . . make Spintex the most effective insulation for guarding against heat transfer and moisture accumulation.

Spintex in flexible and semi-rigid types, plus rigid Rock Cork* and Zerolite*, form a team of Johns-Manville insulations for air conditioning ducts that meet every industrial requirement. Basically mineral products, each insulation has its particular characteristics that make it specially suitable for a specific air conditioning service. All three have the low heat transfer properties needed for high insulating efficiency. Properly installed, these insulations for air conditioning ducts will perform their function effectively for the entire life of the equipment on which they are applied.

Since proper application is so essential to the peak performance of any insulation, Johns-Manville offers industry the services of experienced installation contractors who have made a career of solving complex insulation problems.

J-M Insulation Engineers and J-M Insulation Contractors are conveniently located. They stand ready to combine their talents and give you an insulation job that will pay off your initial investment with maximum fuel savings.

* * *

Why not let us send you a free copy of Brochure IN-135A which gives all the facts about Johns-Manville Insulations for Air Conditioning Ducts? Write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U. S. Pat. Off.

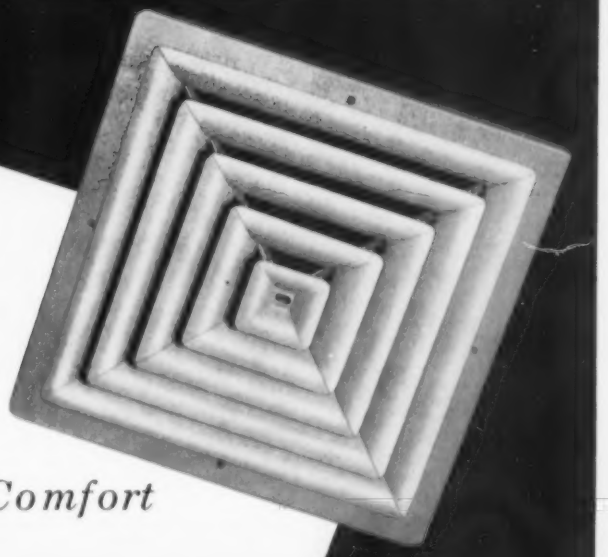
Applying Johns-Manville Spintex insulation on one of the ducts aboard the S. S. United States during construction at the Newport News Shipbuilding and Dry Dock Company. Johns-Manville Insulation Contractors throughout the country know Spintex and other J-M insulations as *quality* products, and take pride in applying them properly for peak performance.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION

2 Beautiful Ways

to assure Draftless Comfort



Lima Series 60

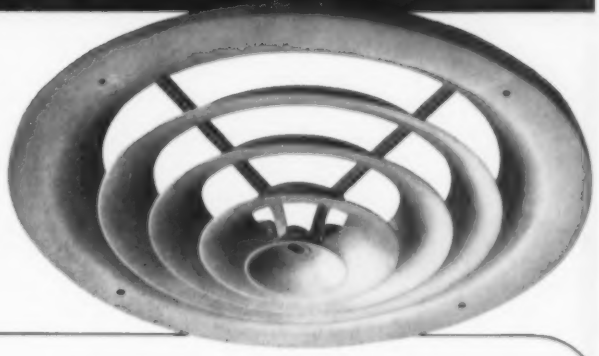
SQUARE STEP-DOWN CEILING DIFFUSER

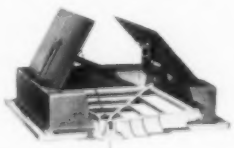
Matches the beauty and symmetry of modern square block ceilings for the finest commercial installations. Available in six sizes.

Lima Series 65

ROUND STEP-DOWN CEILING DIFFUSER

A new high in quality at a low unit cost, for economical commercial installations. Available in seven sizes.





Built-in spring-loaded butterfly dampers provide simple fingertip volume control and positive air shut-off. Lima "Balancing Bell" control feature for easier balancing.

Here's beauty that blends harmoniously with modern commercial interiors . . . and air handling performance that adds up to permanent satisfaction.

Styled to complement modern ceilings, Lima Ceiling Diffusers are engineered to assure draftless comfort in heating and cooling. Lima step-down vanes have curved contour without straight edge for maximum free area. Supply air is gently deflected outward and slightly downward for rapid diffusion in all directions at correct angle to induce aspiration of room air and eliminate ceiling streaks.

Installation is easy and quick. Four screws hold diffuser and built-in damper assembly to pipe duct. Balancing is simplified with volume control right in the diffuser. The attractive light beige finish is permanent and harmonizes with modern ceilings.

Lima Ceiling Diffusers and Dampers offer many advantages as return air outlets and vents, eliminating large unsightly grilles.

Write today for literature and specifications
Sold exclusively through heating wholesalers and manufacturers

Lima REGISTER CO., LIMA, OHIO

There's MORE rating selection available in Allis-Chalmers **MOTORS**

To meet your needs...

Allis-Chalmers Offers Complete Line of Rib-Type MOTORS from 1 to 100 Hp

Allis-Chalmers, a pioneer in rib-type TEFC motor design, is the only leading manufacturer offering a complete line of these motors from 1 to 100 hp. The many cost-saving features of deep-rib construction can be applied in a variety of uses . . . both indoors and out.

Here's why these motors can cut service costs:

MORE cooling surface — Rib-type design provides reserve cooling capacity in dirty locations.

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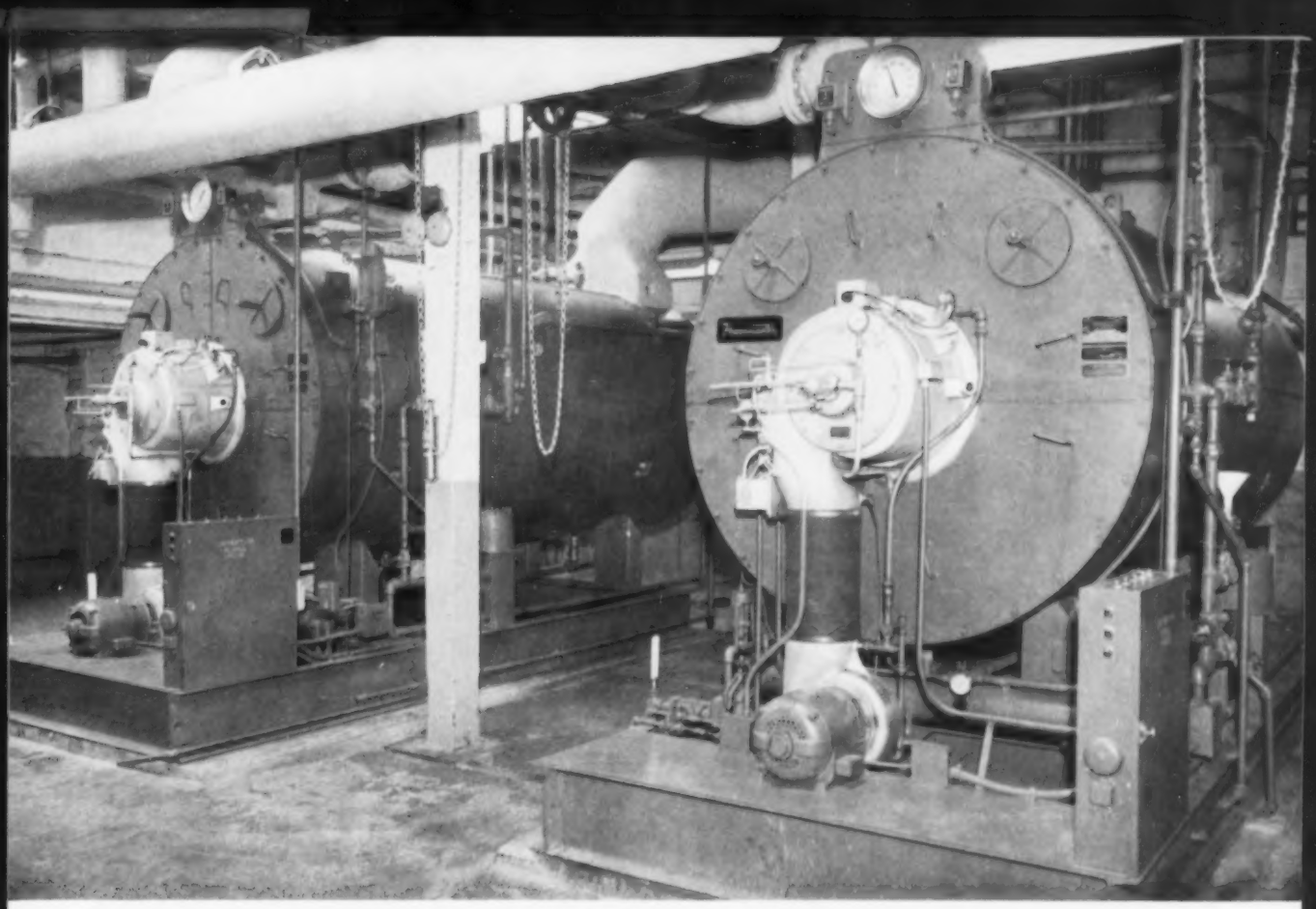
MORE copper — Allis-Chalmers greater use of copper increases electrical life.

MORE lubrication provisions — Large grease reservoirs surround bearings. Provision made for in-service relubrication — important where moisture or corrosive vapors contaminate grease.

As a new machinery component or as replacement, specify Allis-Chalmers. To find out more, contact your nearby Allis-Chalmers distributor, district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

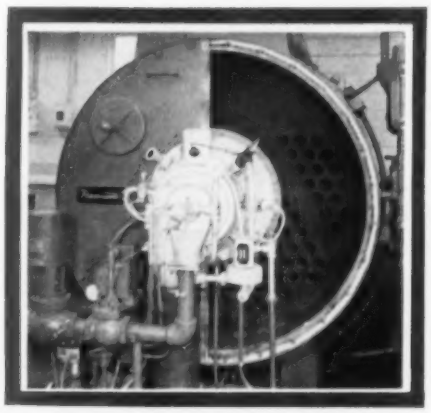
A-4943

ALLIS-CHALMERS



WHY TWO?

Powermaster® PACKAGED AUTOMATIC BOILERS



Time-saving inspection and cleaning of *Powermaster* is provided by easy removal of sectioned front cover without disturbing burner, accessory equipment or piping; by convenient handholes; and by easily removable rear cover. This simple and complete accessibility is a big advantage in maintaining clean, efficient operation over the entire life of *Powermaster* units.

• Major operating advantages are gained by installing two or more *Powermasters* rather than a single large boiler. These include greater assurance of a constant steam supply, increased flexibility of operation, more efficient light load standby, reserve capacity for extra-heavy load demands and for rapid expansion, greater freedom from downtime for inspection and maintenance.

Sizable cost economies also are effected because of *Powermaster's* simplified installation, space-saving compactness, automatic time-saving operation, fast steaming and quick response to load swings, high fuel economy at all loads, maintenance-saving accessibility and other service-proved features.

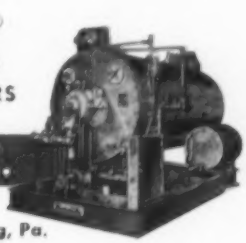
These are reasons why multiple *Powermaster* installations are now serving numerous manufacturing industries, institutions, public buildings, schools, housing projects, laundries, military posts and other steam users.

Be sure you take a close look at *Powermaster* advantages whenever you're looking for a dependable, low-cost steam supply for any plant or building requirement. Ask for Bulletin 1220.

Powermaster®

PACKAGED AUTOMATIC BOILERS

Sizes to 500 hp.; pressures to 250 psi



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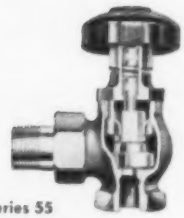
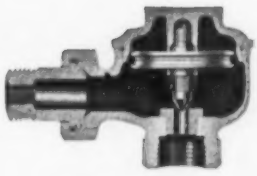
Illinois Control Heating Systems are found in schools, hospitals, churches, apartments, commercial and public buildings of every type from coast to coast. They are offered in five types, and cover the complete range of vacuum and vapor heating requirements.

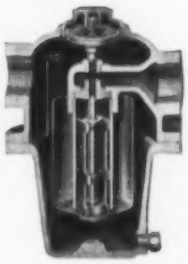
Consult the representative nearest you in our nation wide service.



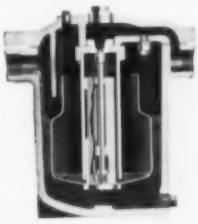
Series 55
Radiator Valve



Series G
Radiator Trap

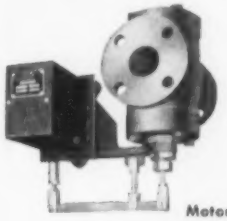


Float and
Thermostatic
Trap

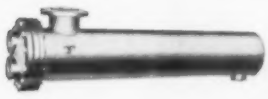


Series 35 Steam Trap

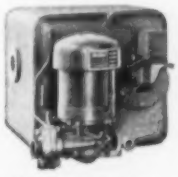
Pneumatic
Zone Control
Valve



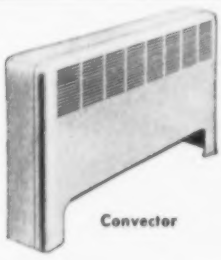
Motorized
Zone Control Valve



ASU Heat Exchanger



Condensation Pump



Convector

Illinois Heating System Specialties

Installing Illinois Specialties, either in new projects or to replace present worn equipment will insure maximum service and economy. Illinois systems are scientifically balanced. All specialties are of our own manufacture, designed for coordinated operation. Manufacturing a complete range of devices enables us to select those that will give the desired results under the most exacting and widely varying requirements.

Illinois Power Specialties

In addition to the equipment illustrated there is also a complete line of power specialties—for medium and high pressures.

No matter what your problem in the handling or control of steam and condensate may be, we will be glad for the opportunity to discuss it with you.

Write for bulletins

illinois ENGINEERING

ILLINOIS ENGINEERING COMPANY

2035 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

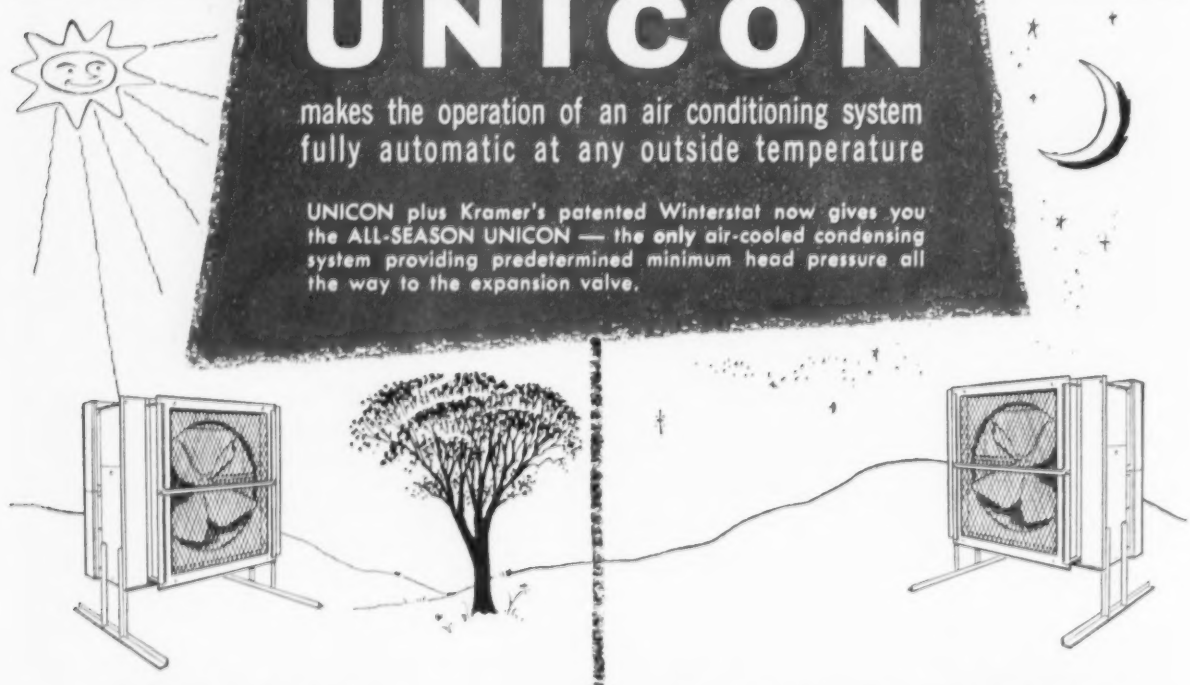
DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

whether it's Summer . . . Winter

The ALL-SEASON WINTERSTAT with the KRAMER UNICON

makes the operation of an air conditioning system fully automatic at any outside temperature

UNICON plus Kramer's patented Winterstat now gives you the ALL-SEASON UNICON — the only air-cooled condensing system providing predetermined minimum head pressure all the way to the expansion valve.



High Noon. . . or cool of evening

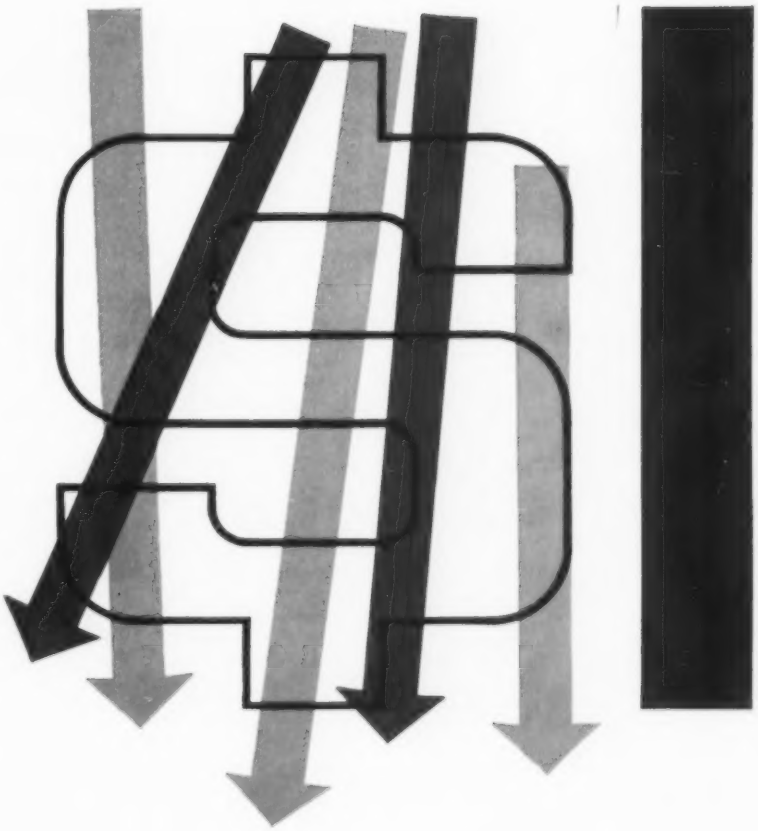
KRAMER TRENTON CO. • Trenton 5, N.J.

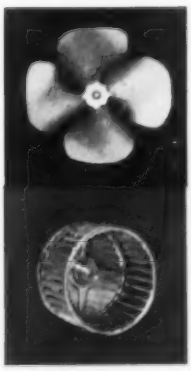
CLOSE TO THE 4 BILLION DOLLAR MARK

Torrington air-impellers are contributing to the quality and saleability of products valued at nearly $4 billion a year. A partial list of product categories:

Room air conditioners
Automobile heaters and air-conditioners
Cooling towers
Commercial coolers
Window ventilators
Kitchen fans
Hassock fans
Electronic cooling devices
Space heaters
Oil burners
Unit heaters

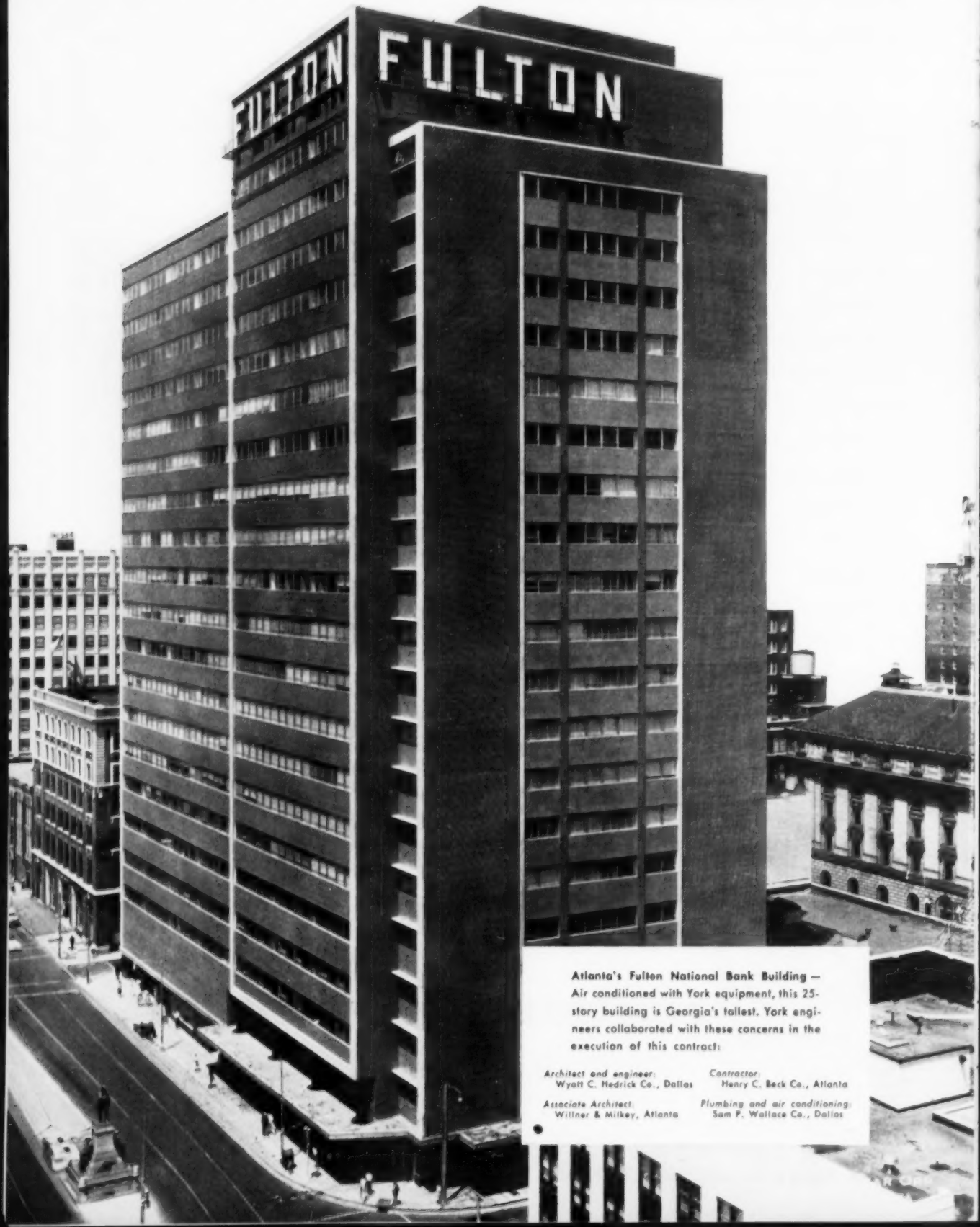
If you have a design or manufacturing problem involving air-impeller equipment, Torrington's industry-wide reputation is your assurance of quality and service.





THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT
VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

York's prior planning service helps



Atlanta's Fulton National Bank Building — Air conditioned with York equipment, this 25-story building is Georgia's tallest. York engineers collaborated with these concerns in the execution of this contract:

Architect and engineer:
Wyatt C. Hedrick Co., Dallas

Contractor:
Henry C. Beck Co., Atlanta

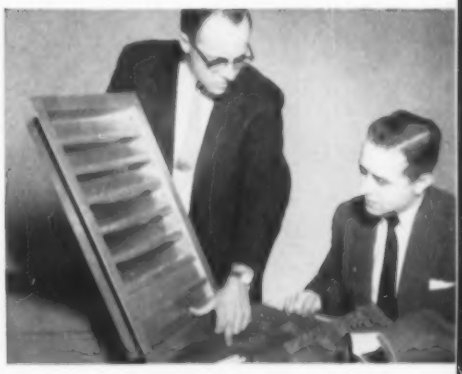
Associate Architect:
Willner & Milkey, Atlanta

Plumbing and air conditioning:
Sam P. Wallace Co., Dallas

assure maximum return on air conditioning investment

Economic analysis — York engineers work closely with builders and owners to determine air conditioning requirements, and projected investment cost per sq. ft. of floor area.

Specification — York makes all systems of air conditioning. The York engineer studies your problem objectively, then assists in the selection of the right system for your particular job.



Design — Your architect or consulting engineer can call on the York engineer early for his suggestions in solving space and design problems, thus helping to avoid expensive changes later.

York sales engineers work with you, your architect, your consulting engineer and your builder from the very first planning stage. York calls this *Prior Planning Service*, and it helps you in these three ways:

1. The York Engineer helps analyze your air conditioning requirements. Your average climate conditions, number of occupants and traffic conditions — these are some of the considerations weighed by the York engineer in making his study of your building. With his broad experience and extensive training, he can analyze your problem and make available to you the facts and technical data you need.

2. The York engineer can help you select the proper air conditioning system. York supplies *all* systems of air conditioning and refrigeration, depending upon the requirements of the job. Thus, your York engineer studies your problem *objectively*, recommending the system that is right for your job.

3. The York engineer can assist in space and architectural design. He can be of aid to your architect or consultant, supplying him with the information he needs to make best use of the available space to guarantee maximum effectiveness of whatever system is chosen.

Clearly, York's Prior Planning Service depends upon superior engineering ability. Realizing this, York selects engineering graduates carefully, then trains them in classrooms, in research and development laboratories, in the factory and in the field. You may rely with complete confidence upon the good judgment and recommendations of the York engineer.

Call him in *early* in your planning.

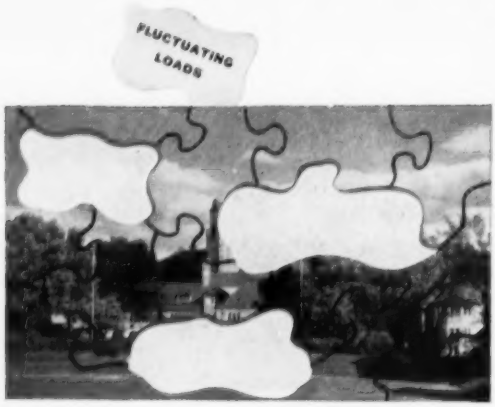
Training — York sales engineers complete an intensive post-graduate course at York. This includes classroom study, plus work in the factory, in the York laboratories and in the field.

York refrigeration air conditioning

the quality name in air conditioning

HEADQUARTERS FOR
MECHANICAL COOLING SINCE 1885

YORK
CORPORATION



HOW A JIGSAW HEATING PUZZLE WAS SOLVED

KEWANEE reserve plus rated boilers

MET SCHOOL HEATING NEEDS

A jigsaw puzzle heating problem . . . that's what it looked like at the Cranbrook School for Boys, Bloomfield Hills, Michigan, since the heating needs were so varied. But every puzzle piece fell into place when Kewanee Reserve Plus Rated Boilers were installed, because all heating needs were solved. Here's the way it worked:

Problem 1: Limited boiler room.

Solution: Two compact Kewanee Scotch Type Boilers with 50% reserve power guaranteed adequate heat under all conditions.

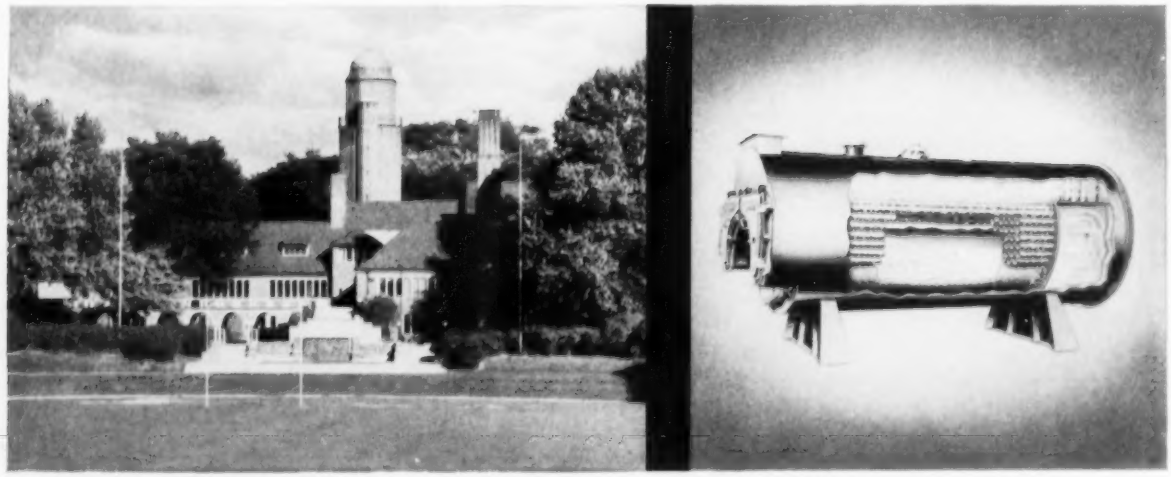
Problem 2: Fluctuating loads—boiler turned off nightly, turned on by stages in the morning.

Solution: Kewanee Boilers had sufficient reserve to assure a fast, dry steam when needed to give quick heat.

Problem 3: Low operating—maintenance costs.

Solution: Since Kewanee Reserve Plus Rated Boilers certify 50% extra power built in, they operate at "cruising speed." Result—less fuel used, less wear on boiler, greater efficiency delivered.

Kewanee Reserve Plus means boilers are rated on nominal capacity, with adequate power to take care of present needs, emergencies and future expansion. Boilers rated on maximum capacity are inadequate for today's fast growing school needs. Next time select Kewanee Boilers.



Cranbrook School for Boys, Bloomfield Hills, Michigan
Heating Contractor: Laing Plumbing & Heating Company, Pontiac, Michigan
Engineer: Snyder & McLean, Detroit, Michigan

Kewanee LM-800 Series for 15 lbs. steam or 30 lbs. water installed in the Cranbrook School for Boys.

KEWANEE BOILER DIVISION
of American-Standard
101 FRANKLIN STREET, KEWANEE, ILLINOIS

KEWANEE BOILERS

You can depend on Kewanee engineering

REDESIGNED—IMPROVED

THE

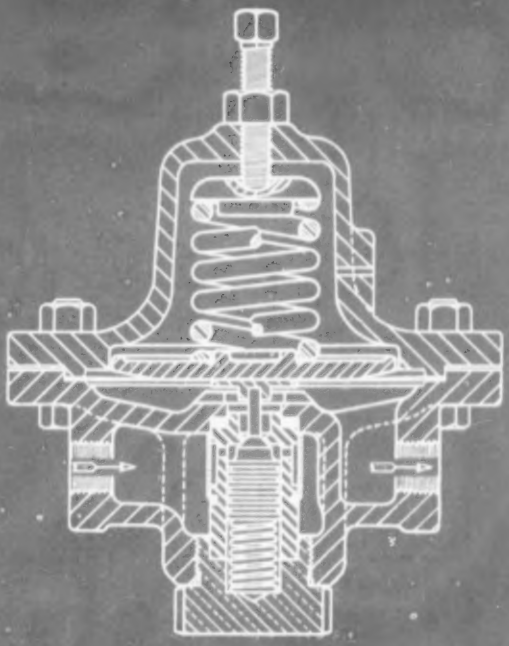
CASH STANDARD

TYPE D

Pressure Reducing and Regulating Valve

NOW . . . half the number of bolts saves maintenance time and . . . gasket seal at diaphragm flange provides easier pressure range conversion.

BUT . . . performance-wise it is still the same dependable valve that CASH STANDARD has offered for over 35 years to provide precise automatic control of most liquids, steam and gases.



- Internal working unit still interchangeable with other models
- Interior easily accessible for quick cleaning or replacement
- Simple construction—minimum of parts
- Built-in strainer
- Available in iron, bronze, steel or stainless steel body, and bronze, stainless steel, nitralloy or monel trim
- Screwed ends, sizes ¼" to 2"

WRITE DEPT. B TODAY FOR COMPLETE INFORMATION, INCLUDING BULLETIN 950

CASH C S **STANDARD**

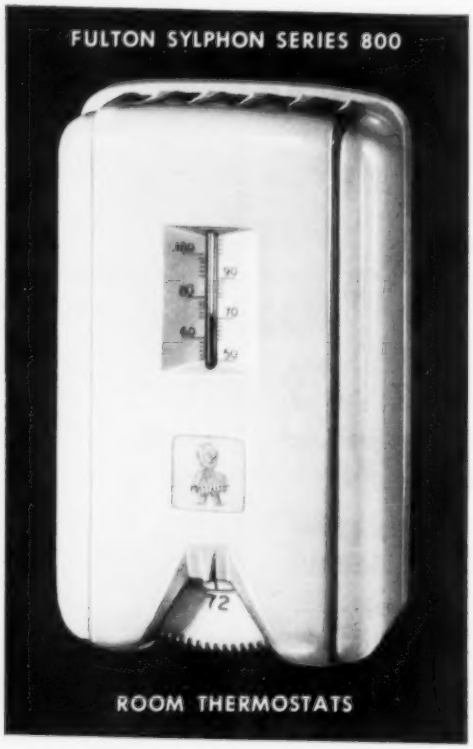
A. W. CASH COMPANY • P.O. BOX 551, DECATUR, ILL.

PRESSURE, HYDRAULIC, TEMPERATURE, PROCESS AND COMBUSTION CONTROLS

FEATURE FOR FEATURE...

HERE'S YOUR BEST THERMOSTAT

for all types of heating and air conditioning



SENSITIVE
No. 801 series has sensitivity of ± ½° F. and No. 802 series has sensitivity of ±1° F.

POSITIVE-ACTION SWITCH
Snap action switch provides for positive open and closed position of switch contacts. Arcing, contact burning and "welding" are minimized.

HEAVY DUTY TYPE
Line voltage type for heavy duty, 20 amp, 125/250 volts AC, ¾ HP at 115 VAC and 1½ HP at 230 VAC.

ACCURATELY CALIBRATED
Dial is accurately calibrated for precise, quick setting of the thermostat.

QUICK-MOUNTING
Mounts on standard 2" x 3" outlet box with only 2 screws; cover need not be removed for mounting.

QUICK RESPONSE
Vapor pressure type thermal element—has large surface-area-to-mass ratio for quick sensing of temperature changes.

18 MONTH GUARANTEE
U. L. approved. Guaranteed for 18 months against defective workmanship or materials.

THREE TYPES
Series 800 Thermostats include types for heating, cooling and combination heating and cooling.

RUGGED CONSTRUCTION
Rugged design provides for years of trouble-free operation.

SAFETY SHOCK-PROOF COVER
Urea plastic is used for cover and dial to provide maximum safety against electrical shock hazards.

FROM FULTON SYLPHON TEMPERATURE REGULATOR HEADQUARTERS, U.S.A.

The practical features of Fulton Sylphon Room Thermostats, give you new, higher degree of accuracy, sensitivity, and dependability at regular thermostat prices. Extending only 1¾" from the wall, the handsome case is appropriate to any type heating or air conditioning installation.

Mr. Controls

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION

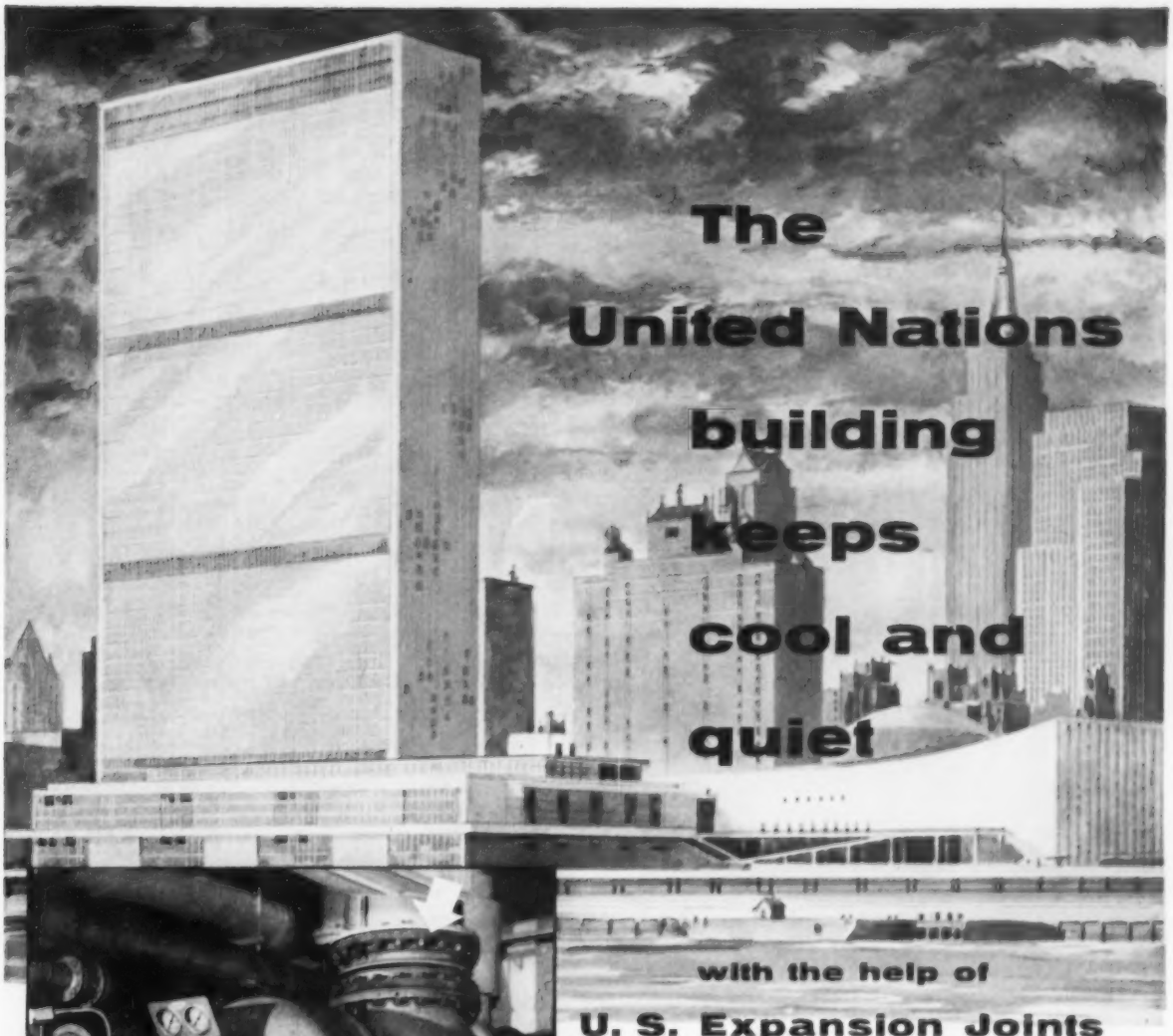
FULTON SYLPHON DIVISION, Robertshaw-Fulton Controls Co.
Knoxville 1, Tennessee (Dept. GH-1400)
Send me descriptive literature on Series 800 Room Thermostats:

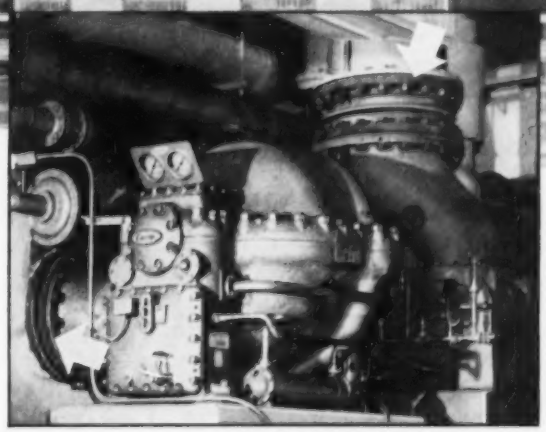
Name_____

Company_____

Address_____

City_____ State_____





with the help of

U. S. Expansion Joints

U. N. personnel remain cool and relaxed in their great edifice. The air-conditioning system is noiseless and vibration-free. Flexible rubber connections known as U. S. Expansion Joints "take up" any movement in the piping, effectively *hushing* and "calming down" vibration and pump noises in the system. In the photo, for example, you see one of the refrigerating compressors in the U. N. building. Note the U. S. Expansion Joints, one going out from the top of the turbine, the other from the side. U. S. Expansion Joints are also used for the chilled-water lines from the water chillers and the refrigerating lines from the refrigerating compressors; also on the water lines to and from the cooling towers.

A product of United States Rubber Company, these joints also offset stresses caused by expansion and contraction. Since they have no moving parts to wear or bind, U. S. Expansion Joints last a long time. Some are still in service after 30 years—a record unmatched by any other joint!

For any pipe line where noise and vibration are problems, contact any of the 28 "U. S." District Sales Offices or write U. S. Rubber, Mechanical Goods Div., Rockefeller Center, New York 20, N. Y.

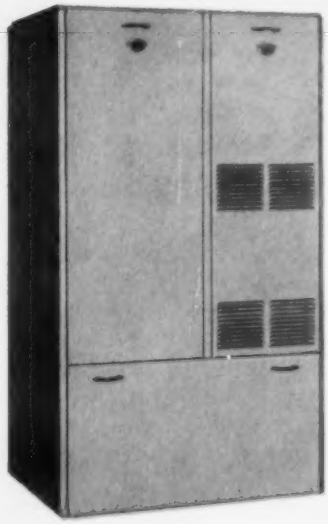
UNITED STATES RUBBER COMPANY

US RUBBER

Mechanical Goods Division

United States Rubber

SHARP POINT! WEATHERAMIC SALES APPEAL



HEATING-COOLING COMBINATION

To make a penetrating selling point long before you get to the feature story, show Utility's Weatheramic® Air Conditioner. At first sight, this year 'round combination heating-cooling unit puts up a winning selling "front" in an eye-pleasing new color—Bank Note Green. With Bonderized undercoat and durable baked enamel exterior, new Bank Note Green is truly a lifetime finish. Under its dashing appearance beats a sturdy heart by Utility, with all the years-ahead refinements you've come to expect: "Floating Chassis" eliminates cabinet vibration—permits installation of furnace cabinet now, hermetically sealed refrigeration unit later; large 12" double width blower resiliently mounted to shush fan noises to a bare murmur; fully automatic controls for split-second switch from summer-to-winter, winter-to-summer operation; compact cabinet styling to save precious floor space.

To build and maintain your already enviable reputation, next time be sure to specify the distinguished good looks, superior engineering, guaranteed dependability and common sense pricing of Utility Weatheramic® Heating-Cooling Combinations.

UTILITY APPLIANCE CORP.

Manufacturers of Utility Furnaces, Air Coolers, Air Conditioners, Water Heaters and Gaffers & Sattler and Occidental Gas Ranges

Weatheramic LINE UTILITY

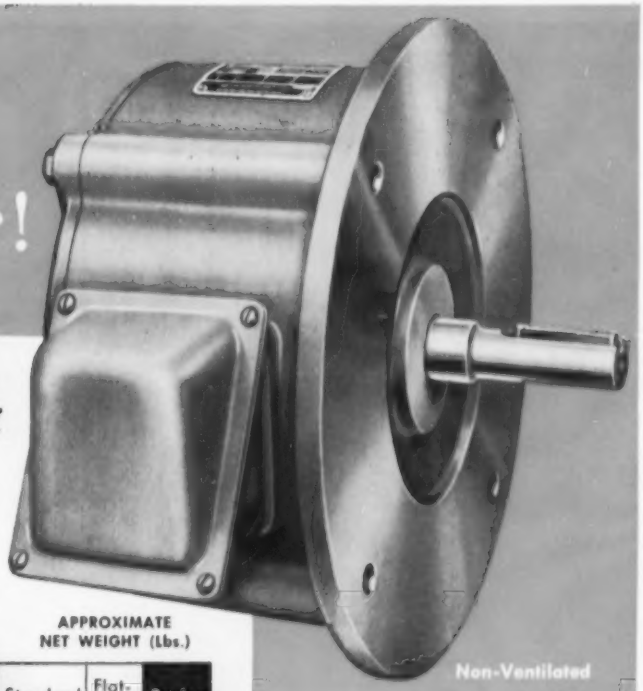
FORCED AIR FURNACES / AIR CONDITIONERS

UTILITY APPLIANCE CORP. 4851 south alameda street, los angeles 58, california

The Motor you asked for!

TAKES less space . . . because it's the new FLAT-Type Motor

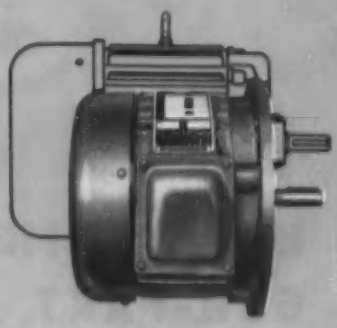
GIVES more service . . . because it's a DIEHL



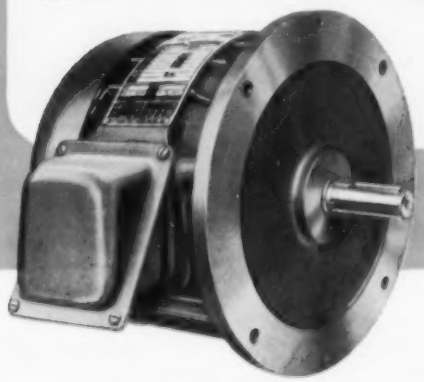
Non-Ventilated

FOR SIZE AND WEIGHT, COMPARE THE NEW FLAT-TYPE WITH STANDARD MOTORS

FRAME SIZE		OVERALL LENGTH (Inches)			APPROXIMATE NET WEIGHT (Lbs.)		
Standard	Flat-Type	Standard	Flat-Type	Saving	Standard	Flat-Type	Saving
DIF 182	DIF 180	14 1/16	10 3/4	3 1/16	82	59	23
DIF 213	DIF 220	17 3/16	11 5/16	5 3/8	128	83	45
DIF 284U	DIF 280	26	13 13/16	12 3/16	272	135	137



New Flat-Type superimposed on standard motor



Fan Cooled

The unique and perfect answer in *integral motors*—designed especially for the machine tool and equipment industries. Packs full horsepower in less space . . . actually up to 48% shorter than standard motors without sacrifice in performance. Many pounds lighter, too, than conventional motors (over 50% in some cases), meaning vastly reduced over-hung weight. Standard radial construction, easy to disassemble and reassemble . . . no precision alignments or complicated air-gap adjustments to contend with. Totally-enclosed . . . no dirt, dust or moisture can get in. Available (non-ventilated) in ratings to 3 H.P., and (fan-cooled) in ratings to 20 H.P.

Perhaps the Diehl Flat-Type Motor is just what you need to solve your application problems. Give us the details and we'll be glad to submit recommendations. Ask for your copy of Bulletin HP-3461.

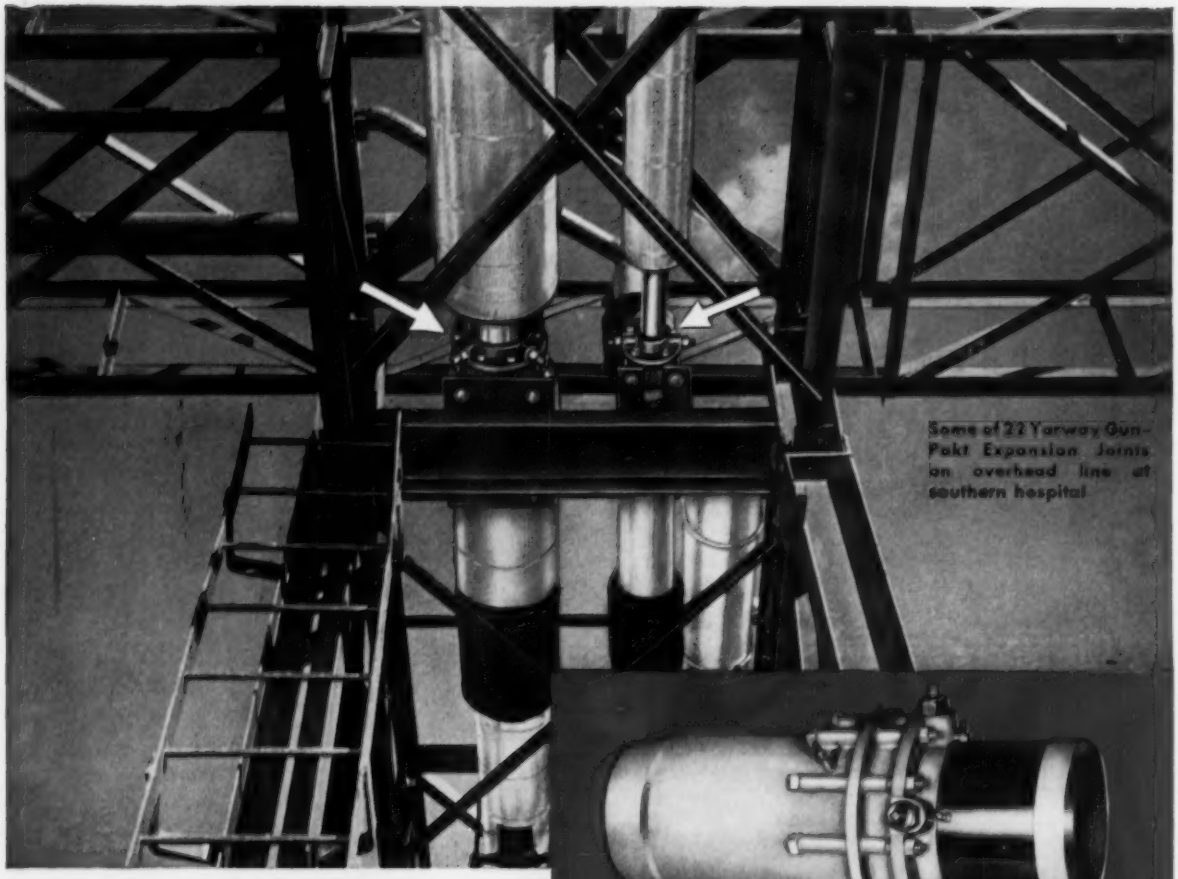
Diehl

DIEHL MANUFACTURING COMPANY

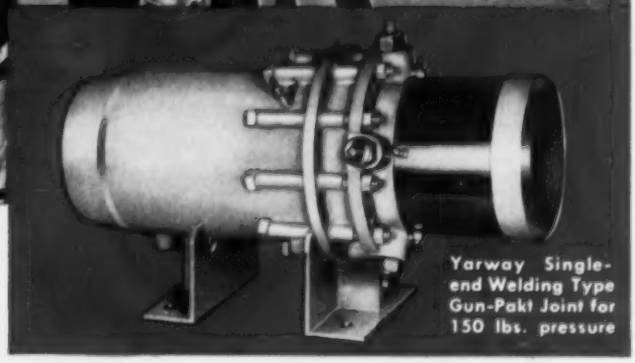
Electrical Division of THE SINGER MANUFACTURING COMPANY

Finderne Plant, SOMERVILLE, NEW JERSEY

ATLANTA · BALTIMORE · CHARLOTTE, N. C. · CHICAGO · CINCINNATI · DETROIT · MILWAUKEE · NEEDHAM, MASS. · NEW YORK · PHILADELPHIA · PITTSBURGH



Some of 22 Yarway Gun-Pakt Expansion Joints on overhead line at southern hospital



Yarway Single-end Welding Type Gun-Pakt Joint for 150 lbs. pressure

HOSPITAL FINDS GUN-PAKT *SURE CURE FOR EXPANSION JOINT TROUBLES*

YARWAY Gun-Pakt Expansion Joints are just what the "doctor" ordered for this overhead steam line at a large southern hospital—and he ordered 22 of them!

In institutions, industrial plants and other large steam distributor systems YARWAY Gun-Pakt Joints are growing in popularity.

YARWAY Gun-Pakt slip-type joints give long life—no fatigue failures.

You need *fewer joints per length of line*, with traverses up to 12″ single and 24″ double.

With Gun-Pakt joints packing may be added as necessary, *under full steam pressure right on the job—no unpacking, no shutdowns.*

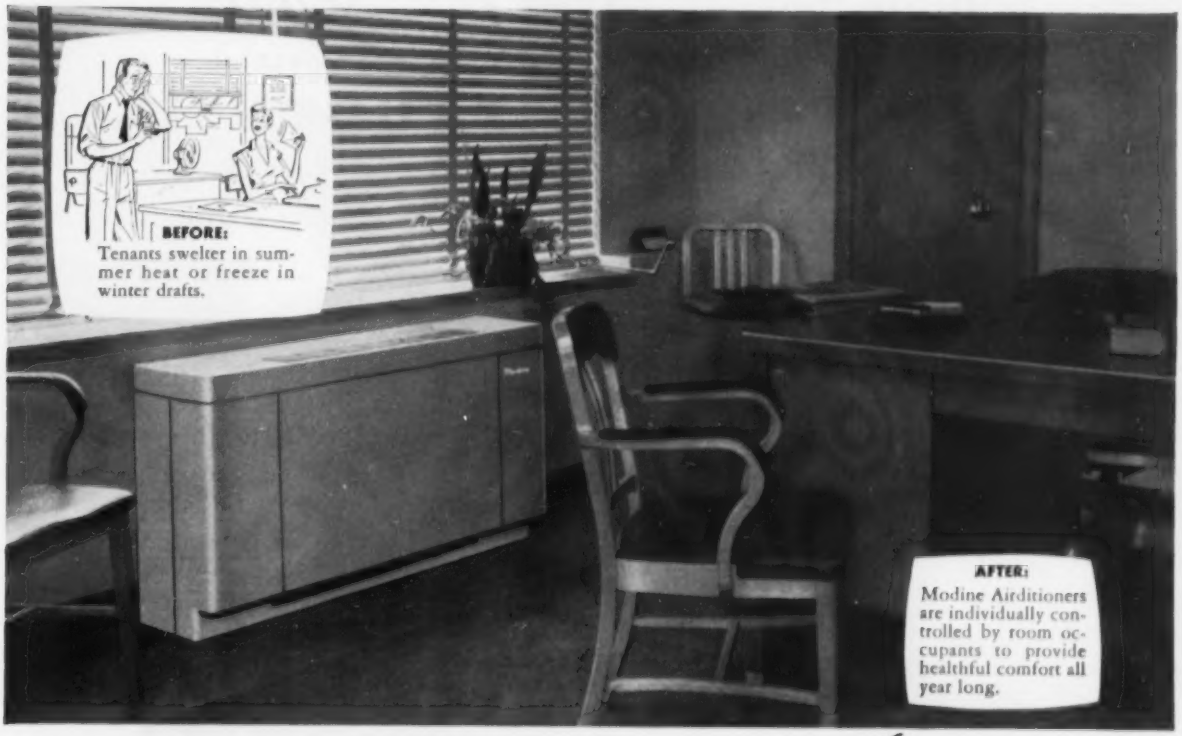
There's also *lower pressure load on end anchors* because excessive strains are eliminated.

All these are reasons why it will pay you to "do as the doctor ordered"—look into YARWAY Gun-Pakt Expansion Joints. Write for Bulletin EJ-1914.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY **GUN-PAKT EXPANSION JOINTS**

Air conditioning existing buildings may be easier than you think...


BEFORE:
Tenants swelter in summer heat or freeze in winter drafts.
AFTER:
Modine Airditioners are individually controlled by room occupants to provide healthful comfort all year long.

It's as simple as this, with Modine Airditioners*

1. **Individual units replace radiators** in each room to be air conditioned. Hot water from your present boiler is piped to each unit for heating. Cold water from a central chiller is supplied through the same piping for summer cooling. A small motor (1/30 to 1/12 hp) operates two quiet fans in each AIRditioner to provide refreshingly cooled or heated air circulation. There are no expensive ducts to install. Here is low-cost, year-round comfort for new or existing office and apartment buildings, hotels or motels, hospitals or homes.

2. **Operating flexibility cuts costs.** With Modine AIRditioners, room occupants control their own temperatures. Units are operated only when and where they are needed. No need to air condition an entire building to provide comfort only in occupied rooms.

3. **Types and sizes for every application.** AIRditioners are offered in console (illustrated), concealed, built-in overhead and exposed ceiling models . . . in sizes to meet your remodeling or new construction requirements. All units are furnished with quiet, slow-speed motors (1050 rpm top speed) having built-in thermal overload protection as a standard safety feature.

*Trademark

Want to know more?

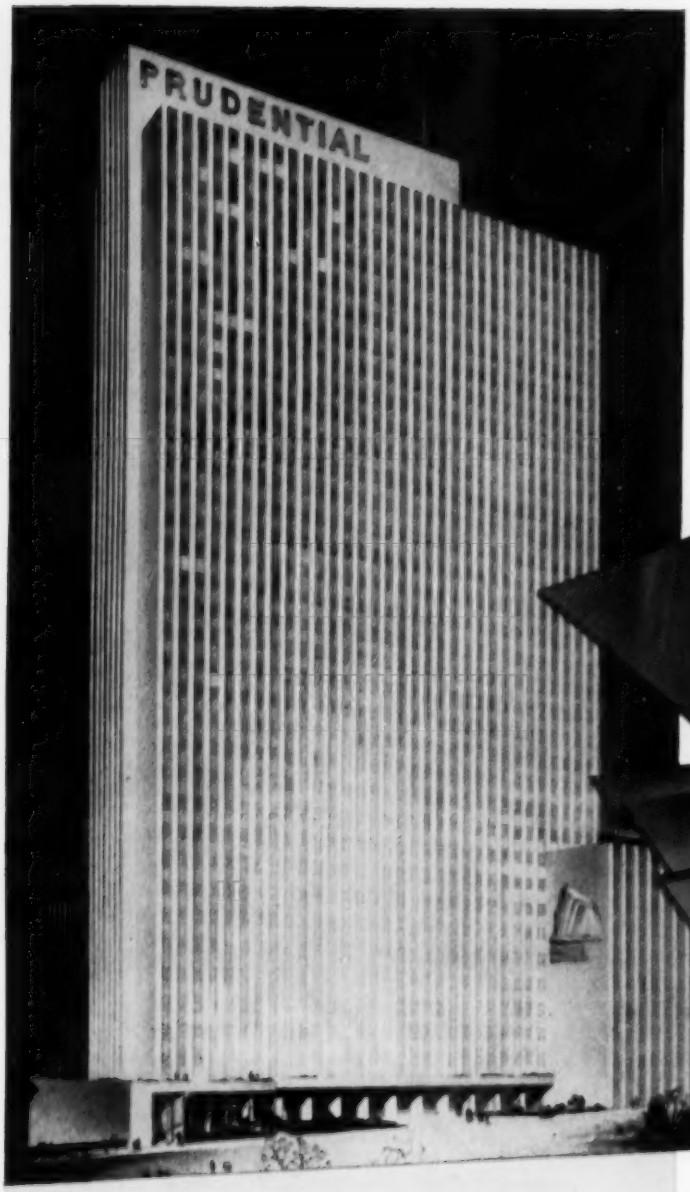
Consult the classified section of the phone book for your Modine representative. Contact him or mail the handy coupon for illustrated booklet.

MODINE MFG. CO.
1509 DeKoven Avenue, Racine, Wisconsin

Gentlemen: Please send me a free copy of Bulletin 745-D, describing Modine AIRditioners.

Name .....
Firm .....
Address .....
City ..... Zone ..... State .....

A-1283



HUSSEY Copper

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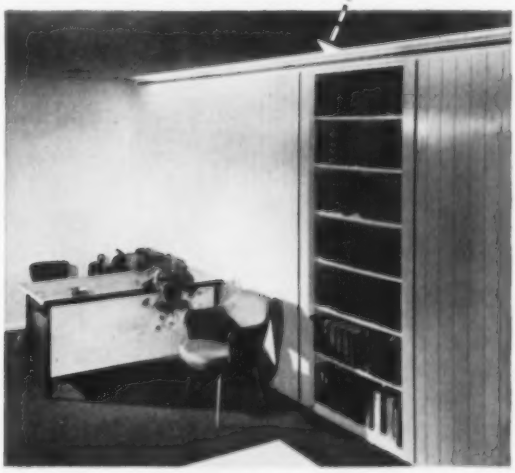
Distinctive Air Diffusers by AGITAIR®

Ceiling installation of STRIPLINE slot diffusers.

for all interiors



Sidewall installation of STRIPLINE slot diffusers.

STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

STRIPLINE slot diffusers are slenderly designed, inconspicuous, practical and versatile. These slot diffusers can be located in walls, ceilings, coves, moulds, window reveals and stools or almost anywhere to suit interior design.

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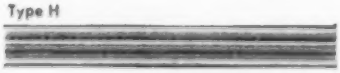

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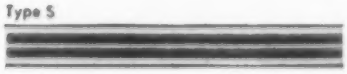

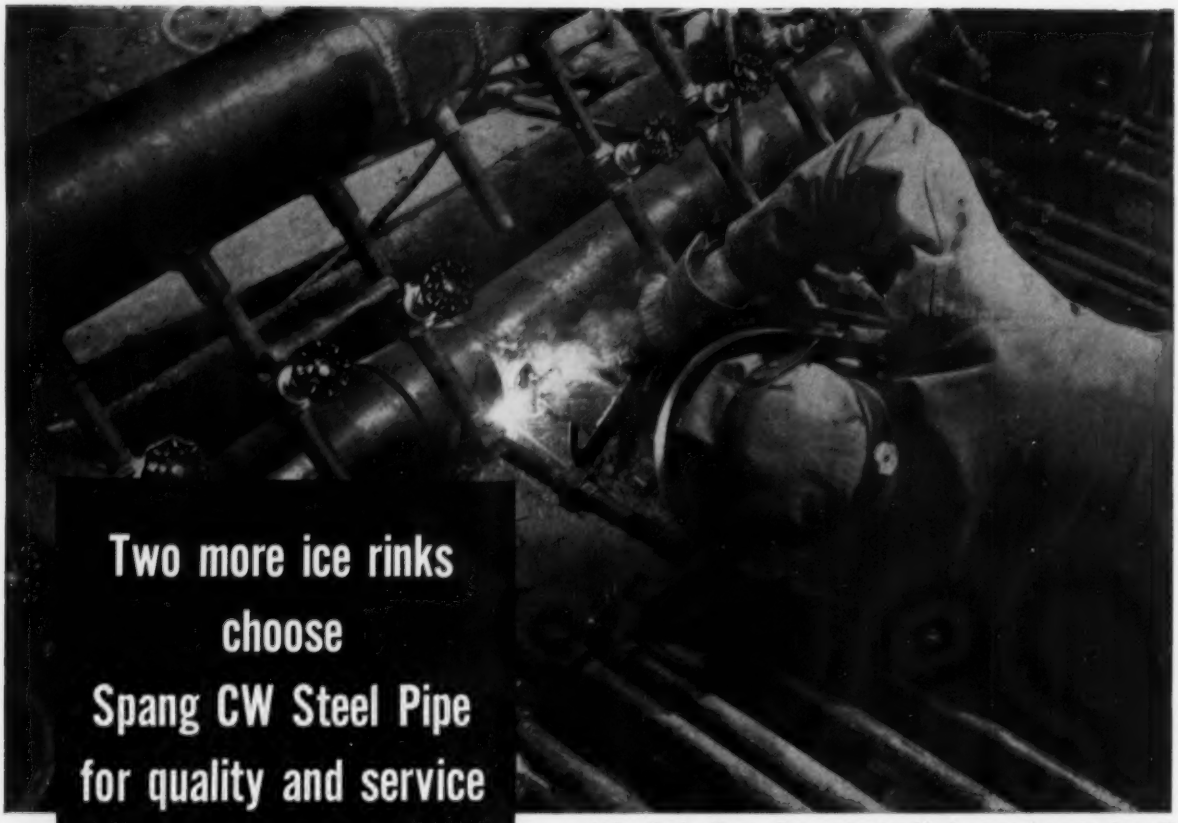

Two more ice rinks choose Spang CW Steel Pipe for quality and service

At Low-Tor Ice Skating Rink, workman welds the connection point that will reduce the 6" SPANG CW Steel Pipe header to 5". More than 7 miles of 1" SPANG CW will feed off these headers to form rink's grid.

AT HAMTRAMCK, MICH., almost 10 miles of 1" SPANG CW Steel Pipe form the grid of Veteran's Memorial Park Skating Rink. Constructed by the Chas. R. Beltz Co., who also built the first rink to use the freon-to-brine system in 1947, this SPANG piped rink can provide hard ice for hockey, damp ice for figure skating or wet ice for racing.

AT WEST HAVERSTRAW, N.Y., winter sports enthusiasts now can enjoy uninterrupted skating facilities from October 15 to April 15 thanks to SPANG CW Steel Pipe. William F. Larkin's Low-Tor Ice Skating Rink, only 20 miles from the George Washington Bridge, also boasts of a novice ski slope that will be covered with artificial snow when the real thing is missing.

With warmer winters in the northern states, there are fewer available skating days on frozen ponds, lakes and flooded fields each year. So, in towns and cities, artificial ice rinks are being installed to provide sports lovers with guaranteed outdoor ice skating all winter long, regardless of temperature.

Two more ice rinks join the long list of those using SPANG CW Steel Pipe to carry the brine refrigerant. It was SPANG CW all the way because of SPANG'S *top-quality* reputation for . . .

EASY INSTALLATION—SPANG'S *quality-control* processes produce a uniform pipe that is easy to cut, bend, thread and weld . . . all-important in the laying out of ice rink grids and in keeping installation costs down.

LONG SERVICE LIFE—SPANG'S *quality-control* builds years of service into every foot of pipe . . . making SPANG CW a first choice among plumbing and heating experts, because they know you can't buy better pipe than SPANG.

Top-quality SPANG Steel Pipe stands up to not only the rigid requirements of ice rinks but every other type of pipe installation, too. Make SPANG CW Steel Pipe your first choice. Your nearby SPANG Distributor will be glad to serve you.

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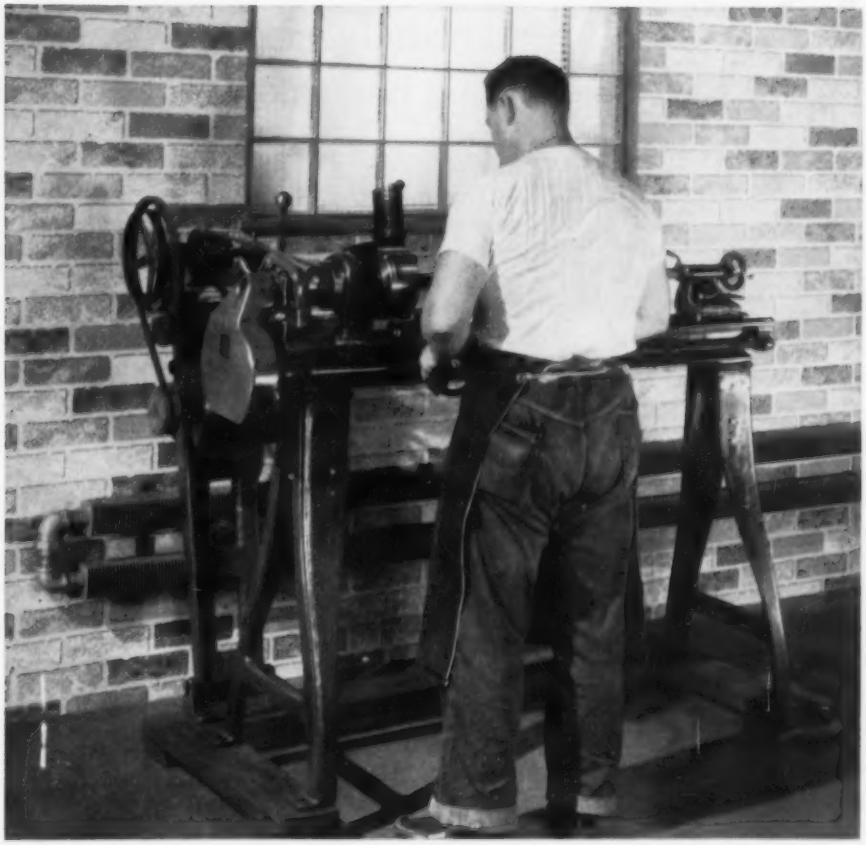
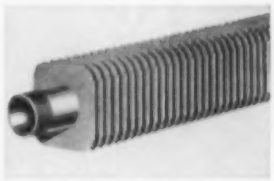
SPANG CW® STEEL PIPE

TEMTRIM Finned Tube Radiation

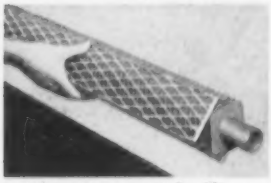
by American-Standard

high output . . . low cost . . . easy installation

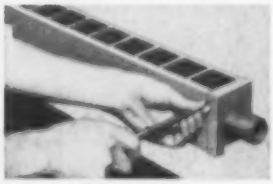




You can install Temtrim with fins exposed . . .



with a snap-on metal grille . . .



a flat top cover or . . .

a sloping top enclosure.

HANG THEM HIGH OR LOW, Temtrim Finned Tube Radiation Units project only 5" into the room—don't steal valuable floor space. They're truly compact, yet they make up one of the most efficient types of radiation ever built.

Temtrim is low in cost and easy to install. It can be quickly connected and hung on the wall. Temtrim is fine for buildings old and new, where hot water or steam systems are used.

Fabricated from steel pressure tubing, Temtrim can be installed with fins exposed or with one of three attractive covers: snap-on metal grille, flat top cover, sloping top enclosure. Temtrim comes in two tube sizes to meet any heating requirement and convenient lengths of 2 to 12 feet, in one-foot increments.

For more information about Temtrim Finned Tube Radiation for industrial, public and commercial buildings, send the coupon below to AMERICAN-STANDARD PLUMBING AND HEATING DIVISION, Pittsburgh 30, Pa.

AMERICAN-Standard

American-Standard
Dept. HP-46
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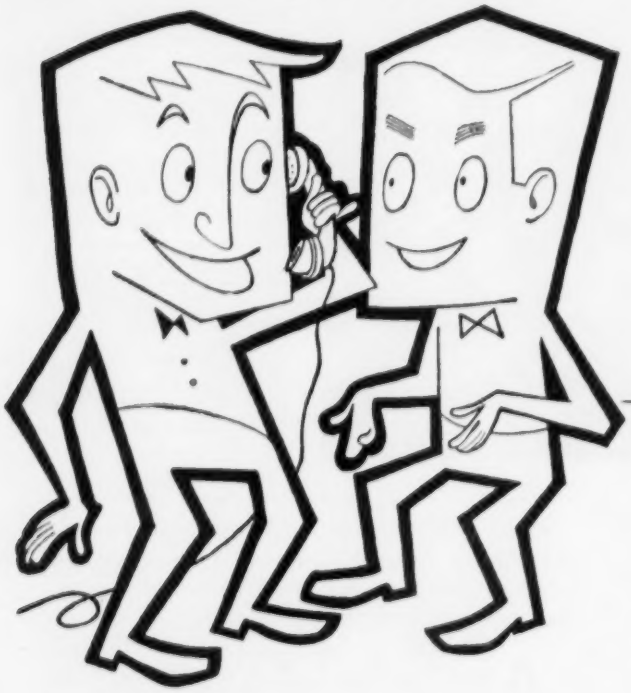
How come you can get all the coal you want? Our deliveries have been slow!

That's because we buy all our coal from mines on the Chesapeake & Ohio. C & O has more coal cars than any other railroad and keeps close to 99% of them in good order. This ready car supply means an uninterrupted flow of coal to consumers.



How about the coal? Is that as good as the service?

C & O territory has always been known for the superior quality coal it produces. And the C & O fuel service engineer is always ready to help us find exactly the right coal for our particular needs.

P.S.

There's a lot more to buying coal than the cost per million BTU. Why not contact coal producers on the C & O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake & Ohio Railway Co., Terminal Tower, Cleveland 1, Ohio, for the assistance of a C & O fuel service engineer.

Chesapeake and Ohio Railway

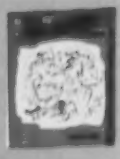
WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

Special Tank Fabrication Problems?

If you have a special fabrication problem that involves tanks—*Novelty has a two fold solution!*

FABRICATION Novelty has over fifty years' experience engineering and building tanks of steel, stainless steel, copper, nickel, monel and all clads. Novelty offers a wide range of experience with heating elements to meet all heating problems.

LININGS Our Novelon Lining Department can offer solutions to most corrosion problems thru the use of rubber, lead, copper and the new plastic linings that allow much higher heat resistance. Considerable savings are often possible by specifying a Novelon Lining instead of more expensive steel alloys—with protection against corrosion guaranteed.



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DIVIDE and CONQUER

HOT WAR - COLD WAR

This well known military tactic finds scientific and practical application in the HOT WAR of summer with invasion of heat, and the COLD WAR of winter with heat loss from buildings.

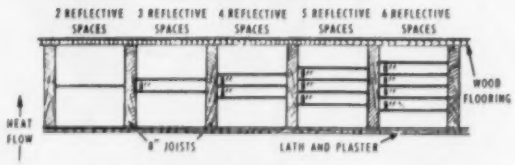
Divide and Conquer, according to the Bureau of Standards. For a marked increase in insulating value because of a marked reduction in heat flow by convection upward and laterally, divide the depth of joist spaces into multiple shallower spaces. This important scientific contribution was the result of research by H. E. Robinson and F. J. Powlitch, under the direction of R. S. Dill, all of the Bureau. Their findings were recently published by the Housing & Home Finance Agency under the title, "The Thermal Insulating Value of Air Spaces, Research Paper 32."

They report that as the temperature difference between bounding surfaces in an air space decreases, convection also decreases. The more the space is subdivided, the greater is the *division of the original spread of temperature.* Therefore each space carries a *smaller burden of temperature difference,* and has greater insulating value. This is true to depths down to about 1".

LAW OF APPRECIATING RETURNS

For this reason, for heat flowing in the up and lateral directions, successive reflective spaces, one behind the other, follow a law of *appreciating* returns. Each reflective space thus formed follows a pattern of increasing insulating value as the number of subdivisions of the joist space increases.

Each 1" reflective space where the joist space has been subdivided in six parts, has greater insulating value than each similar 1" space where it has been subdivided in 5 parts; which in turn has greater value than each such 1" space where there are 4 subdivisions, etc.



Total insulating value in an 8" joist space of 6 such reflective air spaces is *more than twice* that of 3 such spaces, *more than 50%* better than 4.

GREATEST HEAT FLOW BY RADIATION

The greatest flow of heat across building spaces is by Radiation. When aluminum sheets subdivide joist spaces into successive reflective air spaces, heat flow by radiation as well as convection is also drastically reduced, because aluminum surfaces have 97% reflectivity, and 3% absorptivity and emissivity for heat rays. Conduction is slight through the low density air spaces.

The Thermal Factors below were calculated by Infra engineers, with the use of Research Paper 32. The ceiling joist space was taken as $7\frac{5}{8}$" deep; wall stud space $3\frac{5}{8}$"; floor joist space $9\frac{5}{8}$". For 5 and 6 space side heat flow, $5\frac{5}{8}$" stud space was used. The roof was taken as asphalt shingles or roll roofing on $\frac{25}{32}$" solid wood sheathing. Air temperatures were assumed as follows:

	Heat Flow	Inside Temp.—°F	Outside Temp.—°F	Mean Temp.—°F	Temp. Diff.—°F
Walls	side	70	0	35	70
Ceilings	up	80	10 (attic)	45	70
Ceilings	down	90	120 (attic)	105	30
Floors	down	65	30	48	35

THERMAL FACTORS FOR PARALLEL REFLECTIVE AIR SPACES

(In Btu per sq. ft., per hour, per degree F)

Where Dividing Media are ALUMINUM with .03 emissivity, and PAPER, spaced 1" apart.

Calculated on the basis of work done by the

NATIONAL BUREAU OF STANDARDS

For Housing & Home Finance Agency's Research Paper No. 32

Number of REFLECTIVE SPACES	UP-HEAT			DOWN-HEAT				SIDE-HEAT	
	C FACTOR	U FACTOR Attic Floor (roof excluded)	U FACTOR Ceiling & Roof (unfloored attic)	C FACTOR	U FACTOR Attic Floor (roof excluded)	U FACTOR Ceiling & Roof (unfloored attic)	U FACTOR Floor over Crawl Space	C FACTOR Wall	U FACTOR Wall
4 REFLECTIVE SPACES 2 aluminum sheets 1 paper sheet . . . . ⅞" apart	.106	.084	.082	.035	.032	.032	.039	.069	.057
5 REFLECTIVE SPACES 3 aluminum sheets 1 paper sheet . . . . 1" apart	.082	.068	.066	.031	.029	.028	.033	.051	.044
6 REFLECTIVE SPACES 3 aluminum sheets 2 paper sheets . . . . 1" apart	.067	.058	.056	.029	.027	.027	.028	.043	.038

For a FREE COPY of "The Thermal Insulating Value of Air Spaces" and samples of a multiple aluminum insulation which automatically subdivides building spaces use the coupon below.

INFRA INSULATION, Inc., 525 B'way.
New York, N. Y., Dept. H-4
Please send "Research Paper No. 32"

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The Editors' Pages

Air Condition Cincinnati Baseball Dugouts

. . . with remote central type systems for open-fronted enclosures

HPAC Industry Seeks Automated Equipment

. . . to speed operations

THE HEATING, ventilating, and air conditioning industry appears highly interested in the possibility of automation but is not too hopeful of finding the types of equipment suitable to the industry's operations, according to the American Society of Tool Engineers. A national study on automation showed that the industry believes, for instance, that about 40 percent of its production welding operations and 30 percent of its materials handling operations are automatable, but does not believe that any sizable proportion of this automation can be achieved by converting existing equipment.

While it is believed that a certain amount of automation can be achieved by modifying present equipment, opinion as to whether such a procedure would pay for itself is divided about 50-50 in the industry. In contrast, about 90 percent of those replying indicated that the right kind of new automated equipment would pay for itself in increased production and lowered costs. Incidentally, the industry estimates that about 15 percent of its metal forming, grinding, finishing, and inspection operations can eventually be automated, plus about 20 percent of its machining operations.

Indicating the industry's difficulty in locating the type of automated equipment most suitable to its needs is the fact that only about 10 percent of new equipment purchases will specify automation in 1956. The total for the two years, 1956-57, is estimated at around 15 percent. ⧺

PLAYER DUGOUTS, two-thirds of the press box, and the radio and television broadcasting booths at Crosley Field, Cincinnati, are being air conditioned as the Redlegs launch their 1956 campaign, according to the Cincinnati Baseball Club.

Thus, the Cincinnati Club, which is credited with many innovations in baseball since its founding in 1869, becomes the first to provide comfort cooling and dehumidification for players, press, and announcers.

Remote central type systems are being installed in both the home and visiting teams' dugouts and the press box. Window units will condition the radio-TV booths.

Dugouts will still be open-fronted. Thermostatic control will prevent too great a temperature difference between the dugouts and the field.

Work on the project will be started soon. Cincinnati's temperatures are considered among the worst in the league. ⧺

Total Air Conditioning To Be Big Building Norm

. . . predict managers, owners

EVENTUAL 100 percent air conditioning is predicted for all big buildings in two-thirds of the northern U. S. cities surveyed recently by the Trane Co. This prediction was made by a cross section of big building managers and owners in principal cities.

They expect to see this come about in 5 to 10 years in Chicago, 3 to 5 in Des Moines, 3 or 4 in Philadelphia, 2 or 3 in Pittsburgh, and 10 to 20 years in Detroit. In St. Louis, where the summers get hotter, the prediction was 2 years by one building manager, 5 by another.

A new high in tenant interest was reported by more than three-fourths of the managers, based on inquiries and actual requests for air conditioning.

Although all of the survey cities except St. Louis were in the cooler zones of the U. S. — and suffered a hotter summer last year than usual — only a fraction of the building managers thought the surge in interest was temporary reaction to the heat. The others felt that last summer merely made the steady trend toward air conditioning more solid.

"There's a total of some 619 million sq ft of non-air conditioned office and loft space alone, not to mention big buildings like hospitals and other structures," cites Thomas Hancock, executive vice-president of Trane. "And the misconception that air conditioning is mostly for new buildings is dying fast," he adds.

A manager in Pittsburgh declared that "air conditioning is becoming standard office equipment."

In Chicago, Milwaukee, and Philadelphia, management officials noted that pressure from employees is making air conditioning a virtual necessity in retail stores and other places

of consumer business.

Many tenants who formerly opposed air conditioning because it meant higher rents have reversed their attitude. Employees are demanding more comfort, and employers realize that the efficiency of workers remains up if the space is air conditioned. Personnel of some tenants who do not have air conditioning are known to have quit to take new jobs in air conditioned quarters, the survey shows.

One manager reports, "We have gained some of our best tenants from otherwise better buildings which would not furnish air conditioning. And we have an average lease term of ten years in our air conditioned space, compared with less than five in space not yet air conditioned."

Another manager who has a number of insurance firms among his tenants reported a sharp rise in the number of appropriations from home offices to pay for air conditioning of branch offices in his building.

Almost all of the interviewees expected to install more air conditioning or help their tenants make installations. Managers of about half the buildings represented in the survey use or plan to use chilled water piped to individual fan and coil units.

Every building in the survey had some new air conditioning last summer, including numerous window units. "But the real future in air conditioning is central systems," Mr. Hancock says. "The air conditioning of existing big buildings will be a multi-million dollar supplement to the new building air conditioning market in the nation for many years," he believes. ⫩

Atom To Supplement, Not Replace Fossil Fuels

. . . for years to come

ATOMIC POWER will supplement but not replace conventional fuels for many years to come, according to Dr. W. E. Shoupp, technical director of the atomic power division of Westinghouse Electric Corp. At the recent 20th annual meeting of the Industrial Hygiene Foundation, sponsored by the Mellon Institute, he said, "Whether coal and oil last for 100 years or much longer, they will be needed and used. In fact, coal may gradually become too valuable as a source of chemicals for it to be burned as ordinary fuel."

When and where atomic power will become economically competitive with coal and oil and what type of atomic power plant will be the most economical are two questions to which no one knows the answers now, he said. ⫩

Biggest Air Conditioned Hotel in the World

. . . will be New York Statler

THE WORLD'S largest completely air conditioned hotel will be the Hotel Statler in New York, when year 'round air conditioning for all 2200 guest rooms is finished, according to the Carrier Corp. The Statler, a Hilton hotel, is the world's fifth largest hotel.

Installation of the 1250 ton system has already begun, with 500 air conditioned rooms to be ready this summer and the entire job completed for the summer of 1957. Public spaces already are air conditioned.

Built in 1915, it is the first hotel in the metropolitan area to install complete central air conditioning at one time, says Charles V. Fenn, vice president of Carrier's Machinery & Systems Div. He predicts that, as a result, a majority of the better hotels in New York will find it necessary to air condition all guest rooms within the next few years.

Of the 200 hotels in the city listed by the New York Hotel Association, none of the large ones are completely air conditioned at present.

Consulting engineering firms for the Statler installation are Jaros, Baum and Bolles, and Krey & Hunt. The mechanical contractor is Alvord & Swift. ⫩

Room Air Conditioner Sales Outlook Bright

. . . survey reveals prospects

GREAT NUMBERS of people are planning to buy room air conditioners in 1956, the Room Air-Conditioner Section of the Air-Conditioning and Refrigeration Institute was told at a recent meeting. Source of the information was a recent survey by the E. I. duPont de Nemours & Co. which highlighted the great degree of satisfaction experienced by present owners and revealed bright prospects for sales this year.

Over 1 1/3 million units were sold at the consumer level last year, an increase of 30 percent over the year before. Inventories are lower and shipments are higher this year. ⫩

Mechanical Cost Second In Skyscraper Construction

. . . 19 percent of total

THE SECOND biggest single construction item in multimillion dollar New York skyscrapers is heating, ventilating, and air conditioning — 16 percent of the total cost — according to Myron L. Matthews, writing in the Dow Service Daily Building Reports. Only structural steel outranks this item of construction cost.

The total mechanical installation — exclusive of electrical — adds up to slightly more than 19 percent of the total cost. ⫩

Quote"

"Someone has said, 'Wise men learn by the mistakes of others; fools by their own.' I would modify this to, 'Wise men learn by their own mistakes and the mistakes of others; fools never learn.' " — ***William Tyson, technical service manager, Unitary Equipment Div., Carrier Corp., before the Refrigeration Service Engineers Society in Atlantic City.***

NEW HORIZONS

in Heating Comfort

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CORNELL UNIVERSITY

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ARCHITECTS AND ENGINEERS
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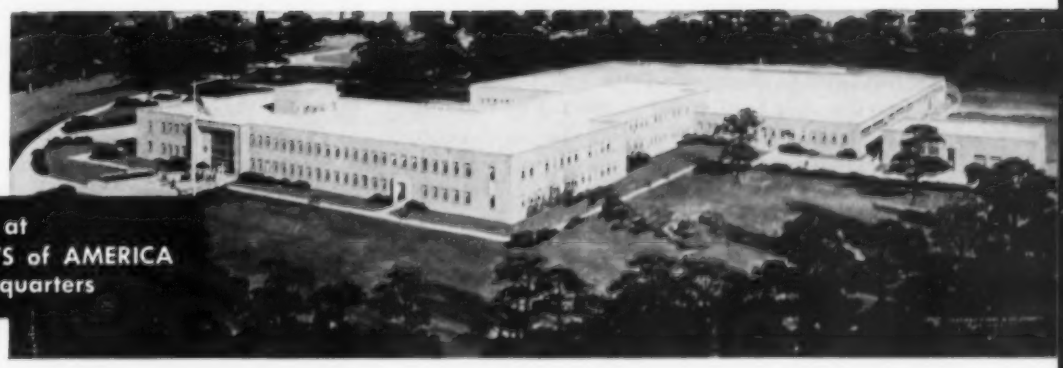

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BOY SCOUTS of AMERICA
Headquarters

A new concept in comfort heating is finding expression in buildings designed by America's foremost architects and engineers.

It's Webster Forced Hot Water Tru-Perimeter Heating featuring continuous bands of warmth along each exposed wall, simplified piping, fewer risers, more room in every room.

Webster Tru-Perimeter Heating using Webster Walvector provides gentle, uniform heat in six new dormitories at famous Cornell University where quality heating and low operating cost were major considerations. Chapman, Evans & Delehanty, New York, one of the oldest firms in its field, were the architects and engineers. Jamieson-McKinney Co., Inc., of Ithaca, made the heating installation.

Another Chapman, Evans & Delehanty design, using Webster Walvector in Tru-Perimeter arrangement, is the new Boy Scouts of America Headquarters Building in New Brunswick, N. J. The heating installation was made by The Frank McBride Co., Paterson, N. J.

For more information on Webster Walvector, call the Webster Representative or write us.

Address Dept. HP-4

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OCEAN AIR ELEMENTARY SCHOOL, CITY SCHOOL BOARD, NORFOLK, VIRGINIA

John A. Simpson, A.I.A.
Architect, Norfolk, Va.

Another new school saves money with the Nesbitt Series Wind-o-line System

The $600,000 Ocean Air Elementary School of Norfolk, Virginia, will have "the thermal environment most conducive to learning" because Architect John A. Simpson specified *heating and ventilating by Nesbitt.*

By designing for a zoned, two-pipe, forced-hot-water installation, the architect reduced costs with the Nesbitt Series Wind-o-line System. Mains and piping were simplified; night controls and approximately 1,000 lineal feet of pipe covering were eliminated.

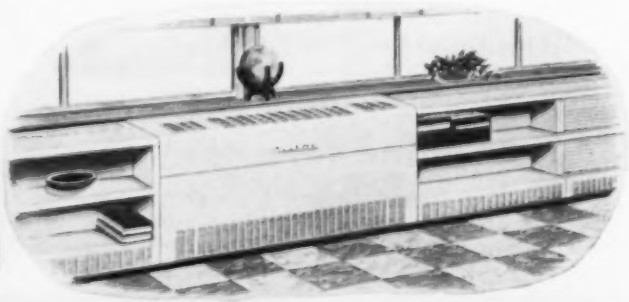
The key to the economy of the Nesbitt Series Wind-o-line System is the Syncretizer's hot water heating element which multipasses a much smaller quantity of higher temperature water than is circulated by conventional systems. This reduces the size of pipes and pumps and permits the Wind-o-line tubing to serve as supply and return piping for entire classroom wings, thus eliminating mains, costly pipe trenches, coverings, and runouts. Without other investment, the system's gravity heat maintains overnight temperatures.

Besides economy, the Nesbitt System offers greater comfort and protection. With the water temperature regulated by outdoor temperatures, the desired thermal environment is better maintained in every classroom and Wind-o-line protection along exposed surfaces is constantly related to actual needs.

Other systems requiring pipe trenches and runouts cost up to 20% more in construction, equipment and installation expenses. It will pay you to go Nesbitt.

Write today for Publication 104

Wind-o-line radiation may be had in wall-hung casings integrated with the Syncretizer, or recessed in standard Nesbitt storage cabinets. Architect Simpson chose this "Nesbitt Package" because it saved 30% over custom wood shelving.



Nesbitt

SERIES WIND·O·LINE SYSTEM

MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA. SOLD ALSO BY AMERICAN BLOWER CORPORATION

"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Can Boiler Ratings Be Unified?

METHODS of rating heating boilers call for scrutiny and careful application on the part of all concerned. Cast iron boilers, as is well known, are rated according to the Institute of Boiler and Radiator Manufacturers' Code, while steel boilers are rated according to the Steel Boiler Institute's ratings. Further, larger steel boilers — Table 1 boilers — are rated on the basis of physical dimensions alone, but smaller steel boilers — Table 2 boilers, or those with ratings up to 5000 sq ft of steam net SBI rating — require testing. Also, steam ratings for Table 2 boilers are about 20 percent higher per square foot of heating surface than Table 1 boilers.

These are but some of the many differences in the various methods of rating heating boilers. In the January HPAC, Herbert C. Johnson, Chief Smoke Regulation Engineer of the City of Columbus, Ohio, made a plea for all boilers to be "rated on the same basis, rather than by three or four methods."

But this was not the beginning or the end of the discussion that has been running briskly in the pages of this department for several months. It all began with an article on improving combustion efficiency titled, *Burning Heavy Fuel Oils*, by Kalman Steiner, in the August 1955 HPAC, in which Mr. Steiner outlined some of the various rating practices and stated that "a boiler rating must satisfy the maximum demand." This was followed in the October 1955 HPAC by comment from L. N. Hunter, Senior Vice President for Engineering and Research, National-U. S. Radiator Corp., who set out to clarify the boiler rating situation. It was from there that Mr. Johnson picked up the question for his comment in January.

Then in the February HPAC, Mr. Hunter returned, commenting that the subject was "complex" and still "confusing" to many. To further clarify it, he briefly explained some of the commercial, economic, and technical factors behind some of the differences in code ratings.

This month, here again expressing dissatisfaction with the present ratings is Mr. Johnson, calling for uniform ratings by some "recognized authority" and hoping that "more realistic ratings" will be provided in the near future.

Also with us this month again is Mr. Hunter, who concedes that the subject cannot be cleared up by "short discourses." Pointing out that rating practices are "not static," he proposes that the current codes be accepted as the best that could be produced out of the circumstances in which they were developed.

HPAC commends the vital interest and forward looking leadership of these friends and readers who have been so willing to share their concern about this important area with the rest of the industry.

Heating Boilers, If Too Conservatively Rated, Penalize Purchasers

I WOULD LIKE to comment further on L. N. Hunter's comments titled *Most Heating Boilers are Selected on the Basis of Their Net Ratings*, in the February HPAC.

Mr. Hunter states that Table 2 boilers must be tested at 175 percent of the SBI ratings. Since Table 2 boilers are rated 20 percent above Table 1 boilers, the test at 175 percent rating on Table 2 boilers will be equivalent to over 200 percent on Table 1 boilers.

Although the customer should have some latitude in deciding whether to choose a boiler that is overrated or conservatively rated, it appears to me that he stands to lose if ratings are either too high or too low. Many customers today are passing up boilers which are too conservatively rated in favor of units with high ratings per square foot of heating surface, thus, narrowing the field of boiler selection, and may be eliminating the possibility of converting the boilers to more available fuels at a later date. The purchaser who does buy too conservatively rated boilers may be penalized by increasing his capital investment and space requirements.

The problem of the cost of testing can undoubtedly be solved. It is possible that burner and stoker manufacturers would be interested in a co-operative program. Bituminous Coal Research, Inc., already has a program in developing coal burning package boilers

at 358 sq ft of heating surface. This size should be of special interest to the steel boiler industry since this is the most popular size in many states and cities where licensed firemen are required for larger steam boilers.

We who have the responsibility of issuing permits for installing boilers must rely on some recognized authority on boiler ratings. We are not at all satisfied with the present ratings, as we must accept what we know are too high for some types of boilers and too low for others. We hope that something will be done to provide more realistic ratings in the near future.

HERBERT C. JOHNSON
Chief Smoke Regulation Engineer
Department of Public Safety
City of Columbus, Ohio

Rate Heating Boilers According to Nationally Adopted Codes Applicable

THE DIFFERENCES of opinion on the subject of heating boiler ratings cannot be resolved by short discourses, oral or written. In fact, it has taken many years of discussion and debate to arrive at our present status, such as it is. The problem is not a simple one, and it is sometimes very difficult to get agreement, even in a small segment of the industry.

It involves many people whose past experiences and philosophies vary widely because they have entered the heating boiler field from different directions. For example, we find those whose past experience is primarily in the power boiler field tend to apply power boiler concepts to heating boiler practice. Some have had background experience primarily in the fuel or fuel burning field. Some of those manufacturers who are least modest about their wide knowledge of the subject are newcomers and have had little or no previous experience with heating boilers.

We sympathize with men in positions like Mr. Johnson's, who must become very confused, apprehensive, and possibly a little disgusted with the many claims and interpretations advanced by the manufacturers of different types of heating boiler equipment. We also like a little sympathy because, as a manufacturer, we make many shapes and sizes of cast iron boilers for various fuels, AGA approved gas boilers, steel boilers of a wide variety of sizes and designs, and packaged steam generators, and these must all be rated.

We firmly believe that the best procedure is to rate in accordance with nationally adopted codes applicable to the particular boilers in question, even though these codes may not give the complete uniformity of rating we would like to have between two given types of boilers. Each code does, however, represent an understanding that has been reached by a segment of the industry rather than the opinions of a few.

We are encouraged by the fact that these codes are not static. They are under almost constant review and are revised from time to time, and new codes are being developed for those not covered by existing codes.

I previously questioned one of Mr. Johnson's earlier statements when he said, "It is evident that Table No. 1 SBI Boiler Ratings will carry nearly 200 percent of the SBI Ratings." It is now apparent that he was referring to the SBI Net Rating rather than the SBI Rating, as defined in the SBI Code.

I expect that evolution and changes in the types of equipment that will be sold in the industry will eventually take care of the testing problems.

L. N. HUNTER
Senior Vice President for
Engineering and Research
National-U.S. Radiator Corp.

Correct Volumes of Warm Air Supply, Return Rated Above Distribution Design

I WOULD LIKE to comment on the article, *New Church Heated by Large Sub-Floor Duct System*, by B. A. Kosarin in the September 1955 HPAC. It seems to me that a warm air system is the best for a structure of this type, since it will heat the floor quickly and give an even distribution of warm air over the space. This is true regardless of the particular design for distribution.

I feel that heating engineers tend to dwell unnecessarily on distribution design. This article is a case in point. While I have no objection to placing the ducts under the floor, I do feel that other designs for distribution would be just as effective and some even less costly to install.

At several points in the article, the author seems to be clinging to some outdated theories which, to my mind, were never correct. For instance, he states that "air is delivered up through diffusers in window stools and 'scrubs' the windows and outside walls, preventing the cold air from dropping to the floor." I have denied this old theory and proved in practice that no such thing as "scrubbing" is necessary.

Back in 1916, I designed the warm air heating system for St. John's church at Salina, Kan. A large stained glass window caused some controversy as to whether it would be uncomfortable for persons seated beneath it. I felt that with the large volume of air movement there would be such an even distribution of warm air and rapid mixing with the infiltrating air that there would be no perceptible drafts anywhere near the window. The system was installed as designed and proved successful.

Having had similar experience in hundreds of churches and other large audience rooms, we do not yield to the "scrubbing" theory, since heat loss through

such an arrangement is sufficient to question its practicability.

Another theory to which the author seems to adhere is that of providing diffusers on 10 ft centers along the walls to insure proper warm air distribution along the outside walls. Our experience has always been that it does not matter where the warm air is introduced as long as the draft that it creates is not objectionable. More important is the volume of warm air introduced and the volume of air returned. If these are proper, any danger of drafts from walls and windows will not exist.

Believing thoroughly in recirculation as a means of distributing heat within a room, we advocate the volumetric theory. Where the volumetric theory is correctly applied, it is not necessary to have a great number of openings distributed over the room. We have demonstrated the correctness of this theory in many large buildings. In the Butler university fieldhouse, for example, at zero F outdoors tests showed only a 12 F difference between the floor and 90 ft above it. This space is 332 ft long, 206 ft wide, and 90 ft high in the center of the roof. This system was described in an article in the January 1930 HPAC.

Warm air rises, regardless of how or where or in how many places it is introduced into the room. If it is introduced horizontally, it moves across the room to the opposite wall and distributes evenly across the space on the basis of weight. Being lighter, warm air floats to the top, and the cooler air stays at the bottom. There isn't any way to change the law by which that comes about. So, when the warm air has distributed itself across the room and the cold air is withdrawn below, gradually the warm air comes down and the problem is mainly one of having a sufficient volume to get that warm air down to the floor while it is still warm.

Another old theory that the author speaks of is putting the building under pressure. That was the theory of the old schoolhouse system based on 30 cfm of outdoor air per person with no recirculation. That pressure was to be depended upon to force the floor level "foul air" up through stacks in the roof. The forerunner of that system provided stack heaters to create a draft. Later, fans were unsuccessfully employed to build up pressure in the building and force the air up in the flues. In many of the flues the drafts were down instead of up, in spite of the fact that the fan was putting great volumes of air from outdoors over the furnace and into the building. Therefore, if pressure could not be maintained within the building when all the air was taken from outdoors, certainly it could not be maintained by taking just a small part of it from outdoors.

Also, the author follows a general practice among advocates of special systems of distribution by claiming better results than are gotten by the "conventional warm air system." He states that in this installation the thermostat can be set 5 F lower than "for conventional warm air systems" because of discharging the heat along the outside walls. I do not know what sort of system he was comparing his arrangement with when he called it the "conventional warm air system." But a well-designed warm air system by any one of four or five different methods of distribution would have given the same result, in my opinion. There is no method of distribution that in itself is responsible for the result.

Every method of distribution must be properly designed and applied and any one of them — when properly designed and applied — will give just as good results as the next. A simple system like the one in the Butler university fieldhouse — with its single supply outlet 50 ft above the floor and a single return opening at floor level, in a place where the draft is unobjectionable — gives just as good distribution as any system that I have ever seen.

A system of warm air floor panels may make possible a lower thermostat setting by utilizing radiant heat from the floor to make up for the lower ambient temperature, but a perimeter strip would hardly be sufficient, in my opinion.

E. K. Campbell
Chairman of the Board
E. K. Campbell Co.

Continuous Slot Air Delivery Satisfies School Heating, Cooling, Ventilation

The article, *Continuous Slot Air Delivery Under Large Windows Prevents Drafts*, by K. L. Beseke and L. J. Schutte in the November 1955 HPAC describes a method of air distribution of importance to classrooms as well as for other comfort applications. I am therefore adding my comments to those of E. Arenz and H. Wright which were published in the January and February HPAC's.

Perimeter air distribution from below an exposed window has been the subject of research by many investigators and is available in the literature of the American Society of Heating and Air-Conditioning Engineers, the special reports published by unit ventilator manufacturers, and in the research files of the specialists of air distribution obtained through laboratory and field studies.

A system of air delivery which uses a continuous slot as reported by Messrs. Beseke and Schutte represents a bold and progressive technique in best satisfying the requirements of schoolroom ventilation, heating, and cooling, in my opinion. Since some discussion has already taken place, it may be well to state the problem in full.

Considering only the winter season, the system requirements to produce comfort may be listed thus:

1) Provide adequate ventilation without drafts for *all* the pupils.

2) Eliminate the effect of downdrafts originating at the cold inside surface of large expanses of glass.

3) Neutralize cold infiltrated air at its sources—the window cracks.

4) Compensate for the net radiant heat loss from the occupants to the cold glass surface.

5) Maintain comfortable relative humidities without incurring condensation on the cold glass surface.

Continuous slot air delivery can be designed to satisfy all of these requirements. Considering each item in turn, I offer the following to support the foregoing contention:

1) A duct design, simpler than the one illustrated by the authors, which will produce an equal rate of flow per lineal foot of a properly designed slot diffuser will possibly provide positive air displacement and distribution along the entire length of the classroom.

When cooling is required, as it often is during mild outside weather (20 F to 40 F) for spaces with a minimum of exposed surface, the use of even a 10 F cooling temperature difference will lead to serious cases of drafts if the supply air is concentrated at one point and not diffused.

On the cooling cycle, in winter, the velocities along the glass surface will either be upward or downward, depending upon the distance at which the upward momentum of the air stream has been overcome by the buoyant forces. In any event, if the moving air stream is not well diffused at the end of its upward travel, the cool air will move downward into the zone of occupancy. The smaller the concentration of supply air at any point along the classroom perimeter and the more efficient the diffuser, the less likelihood there is of discomforts due to this source.

A continuous air supply slot, which inherently eliminates a large concentration of supply air at any given location thereby improves the rate of diffusion, and appears to be a logical choice, from the standpoint of air distribution alone. Such systems have met with wide success in schoolrooms and other applications.

2) A continuous air supply slot will raise the inside surface temperature of the glass so as to prevent the formation of cold currents of air falling downward. Incidentally, the increased heat loss due to warm air impinging against the glass is not as serious as one may be led to believe. A well designed air diffusion slot can reduce the supply air to a room temperature difference of about half the initial value at about 12 in. from the diffuser face. If the system is so designed as to obtain air impingement against the glass after the air stream has traveled 12 in. or more, the moving air temperature would not be 110 F, as suggested by Mr. Wright, but 90 F or even less initially and considerably less at higher elevations along the glass.

3) The supply air is projected upward to mix with and neutralize currents of cold outside air which infiltrate over the entire expanse of glass. A narrow exhaust slot at the bottom of the glass has practically no influence on the motion of air a couple of inches away.

4) At a winter design temperature of zero F, for example, the inside glass surface temperature is about 20 F for single thickness glass windows. Such a low surface temperature will lead to considerable radiant heat loss—and discomfort—from the bare skin of the pupils to the glass. When direct solar radiation is not present, this loss is oftentimes only partially offset by the available diffused solar radiation and will vary more or less, depending on the orientation of the classroom, the geographical location, and atmospheric conditions. A warmer glass surface temperature is therefore indicated to eliminate this source of discomfort.

5) A moving blanket of air, whether it is warm or cold, will effectively prevent the accumulation of moisture and condensation at the glass and will thereby permit the maintenance of comfortable and healthful relative humidities in the classroom.

In view of the foregoing, which includes more than a consideration of window downdrafts, I believe the continuous slot air diffuser offers a most satisfactory and logical solution to the problem of schoolroom heating, ventilating, and cooling.

HRANT H. YOUSOUFIAN
Chief Research Engineer
Air Devices, Inc.

If Developed Under ASA Procedure, Say American, Not ASA, Standard

THE ARTICLE, *More Economical Steel Pipe Flanges and Fittings Can Be Used,* by E. C. Rodabaugh in the January HPAC was interestingly written and contained a great deal of information which no doubt will be of value to anyone working in the heating and piping field. I would like to make one comment, however, concerning terminology when referring to standards.

A standard developed under ASA procedure should be referred to as an American Standard rather than as an ASA Standard. The reason for this is that the American Standards Association does not develop standards itself. It does provide the procedure by which standards are developed. The actual technical work is done by American industry, and the result of this work should be regarded as the property of the nation as a whole rather than of one group.

This point may seem picayune to the public in general, but in trying to get across the picture of the true position of the ASA in relation to the industrial standardization program we attach great importance to it.

S. W. TAYLOR
Mechanical Engineer
American Standards Association, Inc.

what they're saying about REVERE COPPER WATER TUBE

"It's the perfect answer for Air Conditioning Lines in existing buildings like the SOUTHWESTERN BELL TELEPHONE COMPANY,"

Says Allen Sodemann, General Manager
SODEMANN HEAT & POWER CO.
St. Louis, Mo.

ADMINISTRATION AND EQUIPMENT BUILDING OF SOUTHWESTERN BELL TELEPHONE COMPANY, ST. LOUIS

"From the first time we looked over the 31-story Southwestern Bell Telephone Administration Building, we just never gave any other material a second thought . . . copper tube was it. The job had to last . . . and what's more enduring than non-rusting copper? The installation had to be made as fast as possible and with the minimum of rip-up. With the long lengths of copper tube and solder fittings requiring no wrench room or thread cutting, copper again was the answer."

It is these same attributes that make Revere Copper Water Tube the first choice of contractors, architects and engineers for radiant panel heating, hot and cold water lines, processing lines, underground service lines, drain, waste and vent lines. See your Revere Distributor for your needs.

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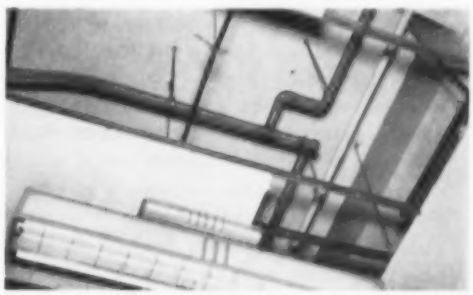
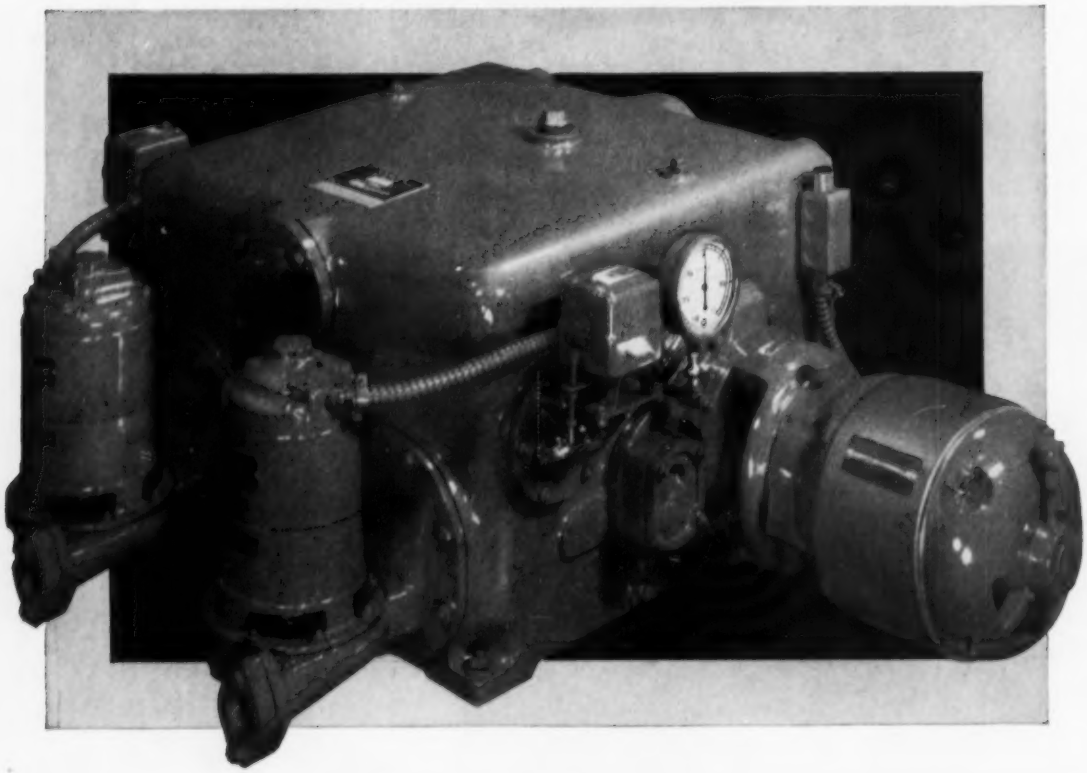
ONE OF THE 1,101 SETS of risers around the perimeter of the building. Using solder fittings with silver alloy brazing made installation speedy, safe, sure.



REVERE COPPER WATER TUBE is made to order for small spaces like those encountered in this false ceiling. No wrench room needed when you use Revere Copper Water Tube. The 45,000 lbs. of Type "L" Revere Copper Water Tube used were supplied by GRINNELL COMPANY, Revere Dist.

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

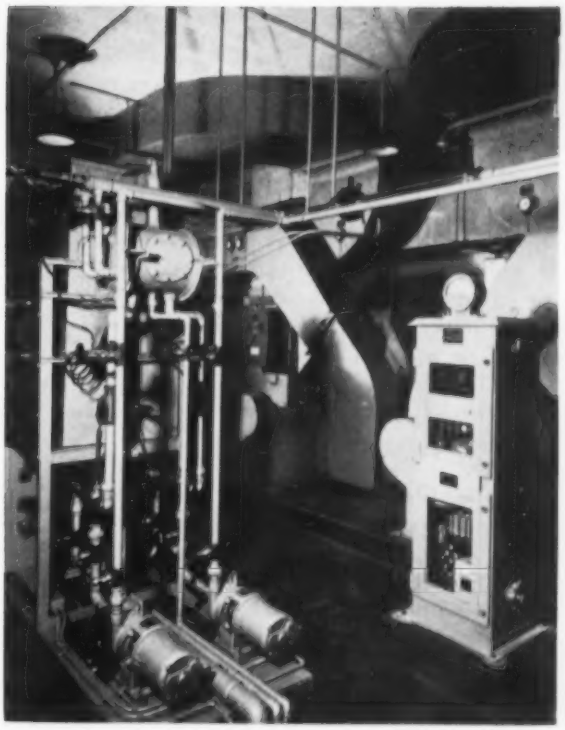
Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.

Air Cooling System Also Heats BBC Transmitter Building



1 VALVE COOLING PLANT for transmitting station includes supply unit, left, for the water cooled transmitters and blowers, center and right, for cooling the transmitter valves

Cooling air from radio valves at a high power VHF transmitting station in England is used for space heating in cold weather. Filtered outside air passes through the transmitter cabinets and then is either exhausted to the atmosphere or recirculated within the building. The recirculation is controlled by motor driven dampers operated automatically by thermostats.

THE AIR COOLING SYSTEM for the two 25 kw transmitters installed at the Wrotham, England, VHF sound broadcasting station of the British Broadcasting Corp. serves a dual purpose. It is also used for heating the building in cold weather. After being filtered, the air drawn from outside is passed through the transmitter cabinets and then is recirculated within the building or exhausted to the atmosphere. The recirculation system is fully automatic and controlled by thermostats.

The systems for both of the 25 kw transmitters are identical.

All six transmitters use air cooled valves and the cooling system of two 25 kw transmitters can serve this dual purpose. In the case of two 10 kw transmitters, the air is drawn from within the building and exhausted to atmosphere, while two 4.5 kw standby transmitters are cooled by air circulation entirely within the transmitter building.

Chimney Serves as Plenum

Cooling air for the transmitters is drawn through a chimney which projects into the transmitter room, See Fig. 3. Air passes into the chimney from two sources, one cold, the other warm. Cold air is received into the chimney from the atmosphere inlet, while warm air is drawn into it through the inlet from the cooler room. The latter provides an indirect intake from the transmitter hall since these are linked by airways comprising openings in the walls between the cooler room and the

transmitter power conversion plant enclosures, and louvers in the doors between the transmitter hall and these enclosures.

The proportion of the air drawn from each source, and thus the temperature of the intake air, is governed by settings of two sets of differentially-coupled louvers in the chimney. The adjustment of the louvers is automatically governed by a temperature controlled electro-hydraulic power unit, the temperature sensitive element of which responds to the variations in temperature of the mixed intake air. So controlled are the louvers that, as the intake air temperature rises, a greater proportion of air is drawn in from the atmosphere, and conversely, as the intake air temperature falls, a greater proportion of air is drawn from the transmitter hall.

In addition, a small finned electric heater is installed at the foot of the chimney and can be switched on manually. It is used to vaporize mist in the chimney when the transmitter is not running, so that when the transmitter is started up, wet mist will not be sucked into the transmitter and recirculated.

From the chimney, the intake air is drawn through a filter composed of stacked glass wool filled sections at the entrance of the intake duct of the blower. A differential pressure indicator, mounted in the cooler room beside the intake duct, measures the drop in air pressure across the filter and serves to indicate by increasing readings the amount of dust deposited on the filter.

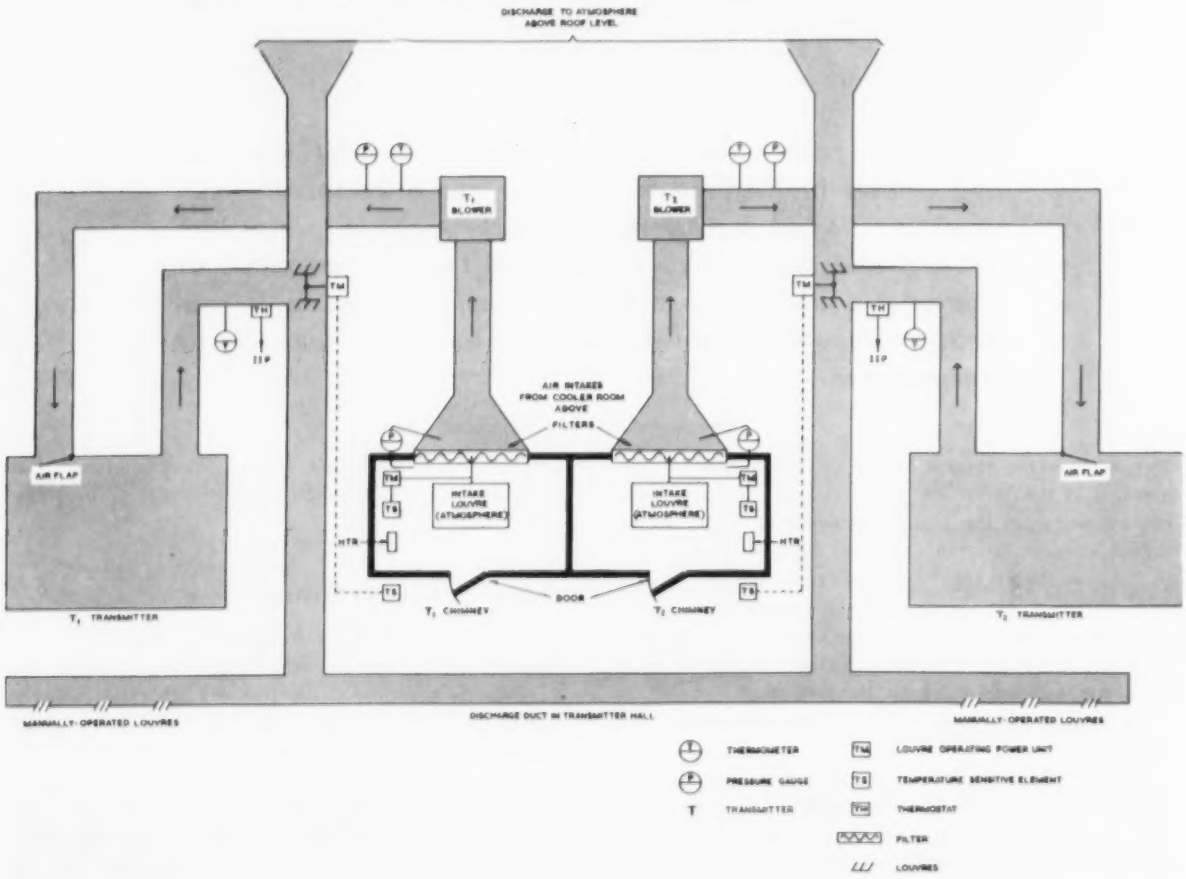
Driving the air blower by a V-belt transmission is an induction motor, the power supply for which is remotely switched from the transmitter control desk. From the blower, the cooling air is fed via a main duct to the transmitter, an air pressure gage and dial type thermometer being fitted on the side of the duct in the cooler room.

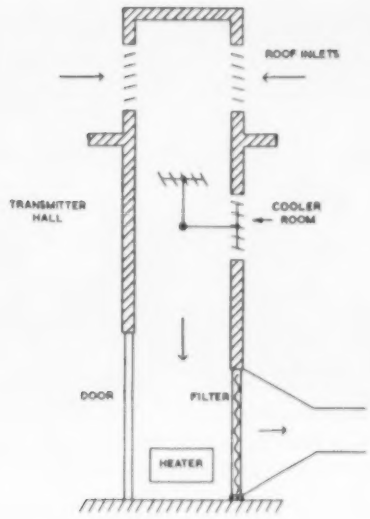
Within the transmitter itself is a series of interlock contacts associated with the transmitter filament supply control circuit. One of these contacts is operated by an air flap and is closed when the air velocity exceeds the minimum tolerable value. A second contact is operated by the air door, while the others are operated by the air feed to certain of the transmitter valves.

Return Heated Air to Cooler Room

From the transmitter, the heated air is returned via a main duct to the cooler room, a thermostat being located inside the duct and so arranged as to light a warning

2 AIR COOLED SYSTEM, identical for two 25 kw radio transmitters, is used to heat building by recirculating air from blowers, instead of exhausting it outdoors





3 AIR INTAKE CHIMNEY receives cold air from outdoors and warm air through door louvers and from the cooler room, which provides an indirect intake from the transmitter hall. Two sets of thermostat controlled motor dampers proportion the amounts of air admitted and recirculated or exhausted

lamp and operate an alarm at the interlock indicator panel in the control room when the air temperature exceeds the safe limit. The thermostat is set so that, under normal conditions, it operates at a temperature just above the maximum occurring during the year.

At a tee junction, of which the return duct forms one arm, the other arms open respectively to the atmosphere and to a duct discharging into the transmitter hall. The proportion of the heated air proceeding along each branch is governed by differentially coupled louvers operated by a temperature controlled electro-hydraulic power unit. This unit is situated beside the tee junction, but its temperature sensitive element is located inside the transmitter hall.

Keep Transmitter Hall Temperature Constant

The proportion of heated air discharged to the transmitter hall is thus governed by the temperature in the transmitter hall itself, and in this way the air temperature there is kept relatively constant.

As the air discharged to the transmitter hall may be drawn again into the circulation system, the controlling louvers are referred to as the "recirculation dampers" and the electro-hydraulic power unit as the "recirculation damper motor." A tell-tale lever on the unit shows the proportion of the air going to the transmitter hall and atmosphere respectively, the limit of its travel being marked "Air to Transmitter Hall" and "Air to Atmosphere."

To be sure that the heated air from both the transmitters is not fed into the transmitter hall simultaneously, the power supplies to the recirculation damper motors of the power units are fed through a three-positioned switch, arranged so that only one motor can be powered at any given time. The louvers associated with the unit not powered then take up a position such that all the heated air is discharged to the atmosphere. The supply control switch for the two motors is mounted on the front wall of the cooler room and has three positions which are suitably labelled.—J. A. GRINDROD. ⊣

Granddaddy Window Unit Solves Cooling Problem

. . . install 3 hp air cooled unit in eighth floor window

"AWFULLY BIG," the average street viewer might observe, with a glance up to an eighth floor window of Atlanta's Candler building.

This granddaddy of all window units actually is a 3 hp air cooled remote condensing unit, placed in the window because that was the only place an air conditioner could be installed, says the Chrysler Airtemp Div. of Chrysler Corp.

The Problem: Randall Brothers Co. of Atlanta, was asked to install an air conditioning system in a 752 sq ft dental suite. The calculated cooling load amounted to 2.2 tons. Room air conditioners lacked sufficient capacity. Available space — a narrow closet — measured 2½ × 6 ft. And the secondary use of the water required for air conditioning was not possible. Another factor important in the installation was a 4 × 7 ft window with an 18 in. ledge.

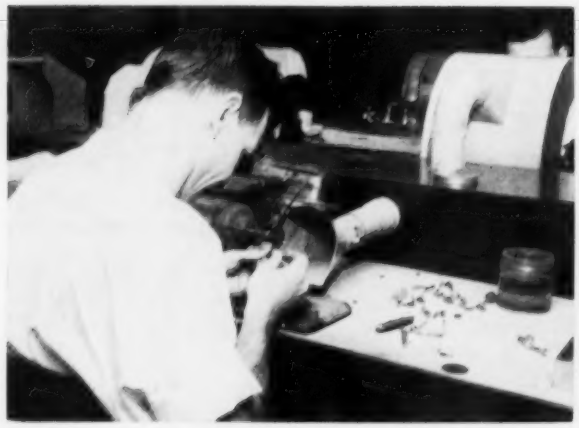
The Solution: A 3 hp air cooled condensing unit measuring 36 in. deep, 32½ in. wide and 22 in. high was squeezed lengthwise through 24 in. doors into the narrow closet, tilted and set on the window sill and ledge. Angle irons at top and bottom of the condensing unit secure it to the building walls. The compressor and other vital parts accounting for about 75 percent of the weight rest upon the building wall.

The unit overhangs the building by only 6 in. and the face of the condensing unit extends only a few inches into the room.

An evaporator coil-blower unit is overhead on a channel iron support between two walls. Outside air is introduced into the blower unit, then circulated into ducts for distribution throughout the suite. The evaporator coil is directly over a sink, and the condensate is piped into it.

The Result: No floor space is required by the air conditioner. No supply or waste water problem exists. And the entire office can be ventilated when the air conditioning is not required.

The condensing unit is sealed into the window in the same manner as a room air conditioner. This unique installation was designed by Robert D. Warren and W. M. Sims, Randall Brothers' engineers. ⊣



GRINDING AND BRUSHING create a serious dust problem, requiring effective exhaust and collection for dust-free air

HEALTHFUL, PLEASANT ATMOSPHERE, with dust problem gone, has improved technicians' work and reduced housecleaning

Dust Collection System Solves

. . . cloth tube collector, exhaust ductwork, and two different sizes of hooding keep dust under control

By Frank R. Culhane

Project Engineer,
Dust and Fume Control Div.,
Wheelabrator Corp.

As told to Edmund Jacobson

DUST AND FUME CONDITIONS from grinding, brushing, polishing, buffing and other operations are a problem in many dental laboratories.

At the Woodward Prosthetic Co., Greensboro, N. C., a cloth tube dust collector, exhaust ductwork, and two different sizes of hooding now keep the dust under control. With the dust problem eliminated, working conditions are more healthful and more pleasant, and the quality of the technicians' work is noticeably improved. And less frequent cleaning of the laboratory is necessary.

Also, dust can be kept out of the motor windings, increasing their lives significantly. Of further importance to this company, dust is prevented from escaping to the parking lot, where it would settle on customers' cars.

Every Operation Produces Dust

Dental dust seems to be produced by almost every piece of machinery used in working on dental plates and other devices. For example, in the finishing of chrome alloys high speed grinding with carborundum disperses dust particles into the atmosphere. The same is true for buffing dentures with rouge.

Other processes like wirebrush cleaning of impression trays and so-called "wet" operations, like wet pumice polishing, can cause bothersome amounts of dust to be dipersed into the working areas of the laboratory. In addition, many operations produce unpleasant odors.

Although the amount of dispersed dust, expressed by weight, is rather small, its very small particle size causes it to travel considerable distances before it settles. Thus, its effect is felt virtually all over the laboratory.

Not only has it beeen recognized that laboratory air permeated by this kind of dust and undesirable odors is not conducive to good health, but it has also been found that operating expense can be out of line. Without dust control, housecleaning in the form of dusting, sweeping, washing, and repainting became excessive. Also, equipment wear and maintenance was found high, with motors being particularly susceptible.

In the Woodward laboratory, the problem was the dust, fume, and odor created at 17 grinding, buffing, and polishing stations. These are on three work benches.

To secure relief, local exhaust ventilation employing hooding, ductwork, and some type of dust collector was investigated. Since so much of the dust was of very fine particle size,

Hoods Have Baffles, Dampers

To corral the dust at the points where it is produced, a sheet metal hood was designed for each machine. In each case, it was positioned out

LARGE HOODS exhaust buffers and polishers. Some have baffles to trap moisture and prevent sludge plugs in ducts

DUST COLLECTOR filters dust laden air from three main ducts. Monthly shakedown and disposal removes dust particles

Dental Laboratory's Dust Problem

of the way so as not to interfere with workmen's operations. Each hood was sized and shaped to pass air at a velocity high enough to overcome not only that of the ambient air currents — which tend to disperse the dust into the room — but also the forces imparted to the dust particles by the various pieces of machinery.

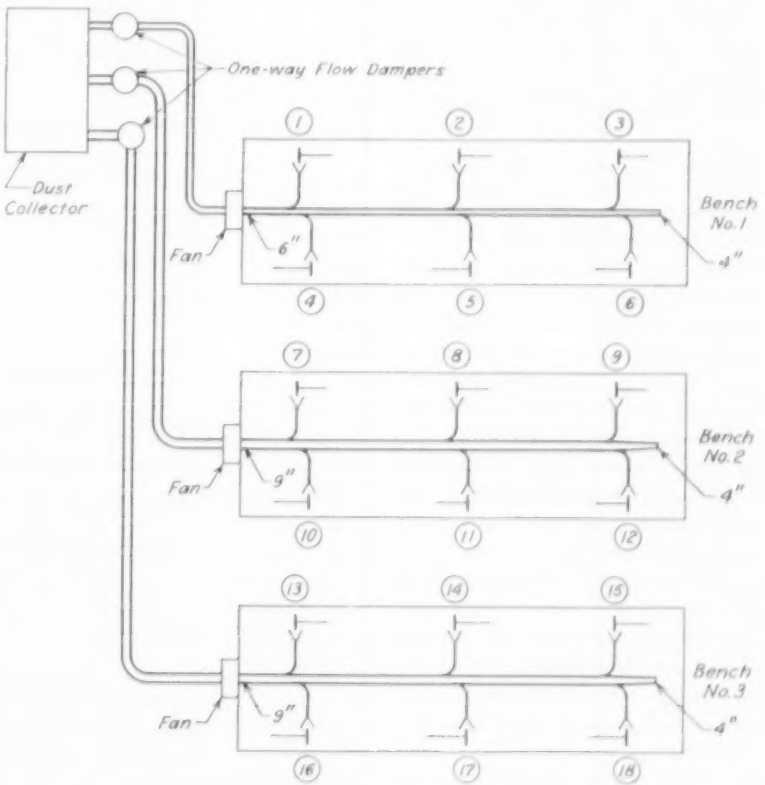
Small hoods positioned low on the work table are adequate for grinding and polishing wheels. Butterfly dampers on these enable the ventilating capacity of the system to be diverted to other machines when these are not running.

Large hoods of the overhanging type were designed for the rouge buffing machines. In the case of wet pumice polishing, vertical baffle plates in the hoods prevent moisture from being entrained in the ventilating air. If this precaution were not taken, plug-ups in the ductwork might be caused by sludge deposits.

Separate Fan for Each Bench

Dust and fume laden air gathered by the hoods is moved under pressure by three fans — one for each bench — into a cloth tube dust collector outside the building. This collector has scores of 5 in. diameter cloth tubes, providing hundreds of square feet of filtering area. As the air passes through, the dust particles are trapped in the tubes, and the clean air is discharged, with no visible matter in it, directly to the atmosphere.

Each month the dust filter tubes are mechanically shaken, whereupon



DUST COLLECTION SYSTEM exhausts 17 of 18 work stations by three separate fans in main ducts to the outside collector

the dust falls into hoppers, from which it is removed for disposal.

The collector is designed to handle 1350 cfm of air, with a maximum of one-third of all the hoods being ventilated by the system at any one time. The maximum back pressure experienced to date has been ½ in. water gage across the filter cloth.

Duct and Fan Sizes Vary

A schematic diagram of the layout of the laboratory is shown in the accompanying sketch. The main duct on Bench No. 1 expands from 4 in. to 6 in. On Benches Nos. 2 and 3, main ducts expand from 4 to 9 in.

Stations Nos. 1, 2, 3, 14, and 15 each have a 2½ in. branch duct. Stations Nos. 4, 5, 7, 8, 9, 13, 16, 17, and 18 each have a 3 in. branch duct. Station No. 6 is not ventilated by the system.

Fans are sized as follows. Bench No. 1 has a slow speed paddle-wheel fan, with a directly connected motor of ½ hp at 1725 rpm. The fan has a 6 in. inlet, and a 7½ in. outlet.

The fans for Benches Nos. 2 and 3, with 9 in. inlets and 9 in. square outlets, have 2 hp motors at 1760 rpm, which are directly connected.

System Operates Satisfactorily

No data has been collected, nor have measurements been made, as to the dust count before and after the installation of the dust control system. Knowledge of what the typical particle sizes would be, gained from years of experience, indicated that the collector system, as designed, would efficiently handle the dust problem. While specific operating data has not been obtained, the system has performed satisfactorily now for several months.

The static presssure against which the fans operate has not been measured since the system was installed and put into operation.

Makeup air is supplied to the laboratory through the air conditioning system. One of the reasons for employing a collector is to keep the air conditioner from being plugged up by the dust. ≠

How to Prevent Cooling Panel Condensation

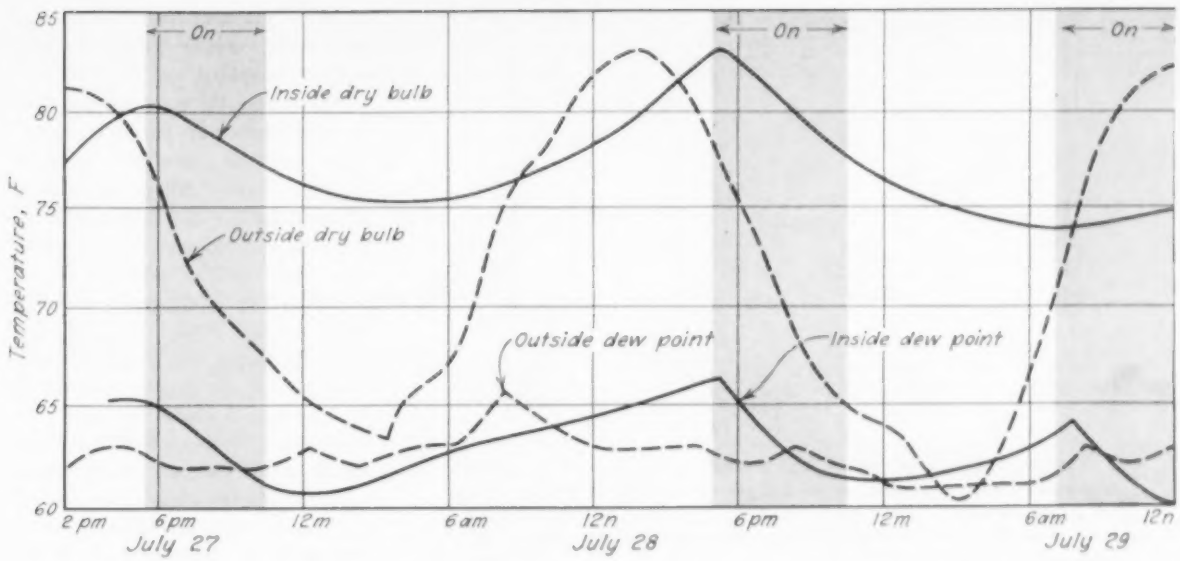
. . . by dehumidifying air and by using vapor barriers

• Cooling panels are effective in removing the sensible component of a building cooling load but are not effective in removing the latent component

• In larger buildings, auxiliary equipment may be used to introduce conditioned air at lower dew point temperatures to compensate for the latent load

• In smaller buildings, a dehumidifying coil within the conditioned space may be employed to keep the moisture content of the inside air below the critical dew point temperature

By Merl Baker and Paul L. Pfennigwerth
Department of Mechanical Engineering
University of Kentucky



1 INSIDE DEW POINT TEMPERATURE is reduced when moisture is removed from the air by a dehumidification unit, as shown here. Shaded areas indicate when the unit was turned on

COOLING PANELS are effective in removing the sensible component of a cooling load, but removal of the latent component requires consideration of auxiliary equipment. Several supplementary methods may be used to compensate for the latent load, and are discussed subsequently. Also discussed are factors that must be considered in preventing moisture from collecting on the panel cooling surface.

In larger buildings, auxiliary equipment may be used to introduce conditioned air at a sufficiently low moisture contents to compensate for the latent load. This application is especially feasible for cooling loads that have high sensible to total load ratios.

For smaller buildings, dehumidifying coils in the conditioned space may be employed to keep the moisture content of the inside air low enough. This method seems desirable where ventilation occurs by infiltration through windows or other natural openings. Cold water from a refrigeration system may be passed through the dehumidifying coils first and then discharged at a higher temperature into the cooling panels. Because of the speed of diffusion, a dehumidifying coil can serve a rather large volume of the structure.

Remove Moisture: 1 Qt per Hr

The performance of a dehumidifying coil was studied by operating a small air conditioning unit intermittently in a 12 by 14 ft room of an apartment.

The room contained two windows and had doors leading to other rooms on three sides. All windows and doors were closed while the air conditioner was in operation but were opened for normal night cooling after the outside air became cool.

The dehumidifying coil removed moisture from the air at the rate of 1 qt per hr, and as a result it significantly lowered the dew point temperature of the room air. The effect of the coil on the dry and wet bulb temperatures of the room air is shown in Fig. 1.

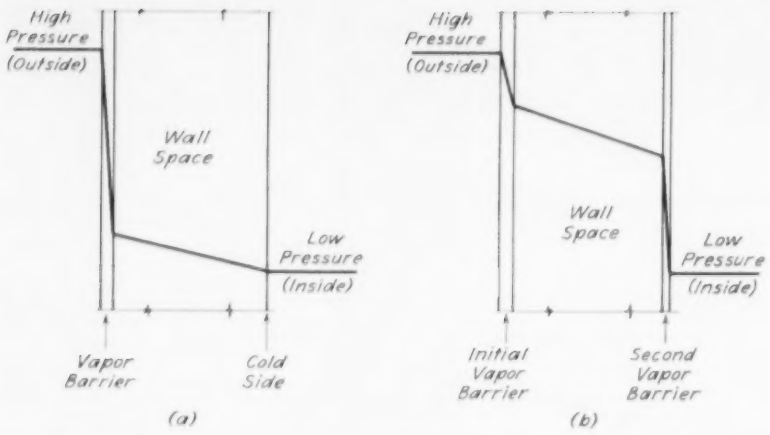
Infiltration Determines Design

Infiltration of warm humid outdoor air and occupants are the chief sources of moisture in offices and small commercial structures.

The amount of moisture added by infiltration alone is enough to require the use of dehumidifying coils with panel cooling. In every case, sufficient coil surface must be selected for satisfactory control of the dew point temperature for all loads. A 60 F dew point temperature is considered satisfactory for most cooling operations.

To aid in designing coil surfaces for this application, weather data analyzed for 10 cities in various parts of the U. S. showing the frequency of occurrence of high dry bulb and dew point temperatures is given in Table 1. The latent and sensible energy of outdoor air is presented in Table 2. This data together with a knowledge of internal moisture sources enable a determination of the probability of panel condensation for a particular locality and load condition.

The sensible cooling capacity of a panel is a function of the surface temperature, and accordingly lower surface temperatures are required at high sensible loads. Condensation is most likely at simultaneously occurring high dry bulb and dew point temperatures. If no outdoor air enters the conditioned structure, the outside dew point has no bearing on the design, and, accordingly, only the



2 VAPOR BARRIER (a) on the high pressure side of a building reduces the pressure below saturation as the cold side of the wall is reached. Pressure gradient maintains a low pressure behind the barrier. If a second resistance is met (b), the vapor does not escape as rapidly, and thus higher vapor pressure is maintained within the wall

dry bulb temperature will be a factor when considering different localities.

Discuss Panel Types

Two general types of cooling panels employing a liquid heat transfer medium are used—a metallic surface integrally attached to channels conveying the cooling medium and a plaster or composition surface containing embedded tubes. A finished metallic surface is impervious to water vapor and the prerequisite for satisfactory operation is that the surface temperature be maintained above the dew point of the room air, otherwise vapor would condense on the surface.

Plaster transmits water vapor, and should the surface temperature of the embedded tubes be below that of the room air dew point temperature, condensation would result at the tube surface. Because of the required temperature difference between the surface of embedded tubes and the panel surface, high heat transfer rates are impossible if condensation at the tube surface is avoided.

By covering the panel surface with an effective vapor barrier, condensation on the embedded tubes is avoided. Metallic foil is an excellent selection for a surface barrier, however, the decorative scheme of buildings might not be enhanced by its use. Whenever wall paper is to be used, the foil would be placed between the paper and plaster surface. Some paints are highly resistant to the passage of vapor and might be satisfactorily employed. Plaster may absorb a limited amount of water without damage, as it thoroughly dries when the panel is reversed at the end of the cooling season. If the drying proceeds at too rapid a rate, paint may blister or paper crack. This is not expected, however, if the vapor barriers on both the room side and back side of the panel are good.

A third type panel employs conditioned air as the heat transfer medium. By admitting an adequate quantity of air to the conditioned space, moisture control is achieved. A vapor barrier on the back side of the panel is necessary, however.

The maximum quantity of water vapor mixed with air for a given

TABLE 1—WEATHER DATA presented here for 10 U. S. cities shows extreme temperature and humidity conditions. Figures are averages (days per month) for the period 1945-50

Weather Conditions		Atlanta	Chicago	Dallas	Lexington	Los Angeles	Minneapolis	Nashville	New Orleans	New York	St. Louis
Maximum dry bulb temperature reaches or exceeds 90 F	June	11	5	20	4	1	3	13	20	2	7
	July	12	7	27	7	2	8	14	19	3	11
	August	10	7	27	8	3	8	13	19	3	10
Maximum dry bulb temperature reaches or exceeds 85 F	June	19	11	26	14	2	7	21	26	7	15
	July	26	15	30	17	10	14	25	28	12	21
	August	23	15	30	16	9	13	23	23	9	20
Average dry bulb temperature reaches or exceeds 77 F	June	16	6	24	13	0	3	16	29	6	13
	July	22	10	30	12	3	10	22	30	12	19
	August	21	10	30	11	3	10	17	31	3	15
Maximum dew point temperature reaches or exceeds 72 F	June	2	3	11	5	0	1	5	25	2	6
	July	9	4	15	8	0	4	13	28	3	7
	August	6	5	7	8	0	3	12	29	4	7
Maximum dew point temperature reaches or exceeds 68 F	June	15	8	23	13	0	5	15	28	7	12
	July	22	10	20	18	0	9	22	30	15	14
	August	23	11	22	16	0	9	20	31	3	16
Simultaneous occurrence of maximum dry bulb temperature equal to or greater than 90 F and maximum dew point equal to or greater than 72 F	June	1	1	9	1	0	1	3	17	1	3
	July	4	2	12	3	0	3	7	18	1	5
	August	3	3	5	4	0	3	7	18	1	5
Simultaneous occurrence of maximum dry bulb temperature equal to or greater than 90 F and a maximum dew point equal to or greater than 68 F	June	7	3	18	3	0	2	8	20	2	5
	July	8	4	25	6	0	5	11	19	3	8
	August	9	7	19	5	0	4	10	19	2	9
Simultaneous occurrence of maximum dry bulb temperature equal to or greater than 85 F and a maximum dew point equal to or greater than 72 F	June	2	3	17	4	0	1	5	25	2	4
	July	7	3	14	6	0	3	11	26	2	6
	August	5	4	6	6	0	3	10	27	2	7
Simultaneous occurrence of maximum dry bulb temperature equal to or greater than 85 F and maximum dew point equal to or greater than 68 F	June	12	5	21	9	0	3	13	27	4	10
	July	18	7	26	13	0	7	18	27	7	13
	August	18	9	22	11	0	7	17	29	5	14

TABLE 2—WARM, HUMID OUTSIDE AIR is analyzed according to energy relative to room conditions. Frequencies (days per month) are shown here for 10 U. S. cities

		Atlanta	Chicago	Dallas	Lexington	Los Angeles	Minneapolis	Nashville	New Orleans	New York	St. Louis
(a) The sensible load equals or exceeds 7.2 Btu per lb of outdoor air and (b) the latent equals or exceeds 6.2 Btu per lb	June	1	1	9	1	0	1	5	17	1	5
	July	4	2	12	3	0	3	7	18	1	5
	August	3	3	5	4	0	3	7	18	1	5
(a) The sensible load equals or exceeds 7.2 Btu per lb of outdoor air and (b) the latent equals or exceeds 5.8 Btu per lb	June	7	3	18	3	0	2	8	20	2	5
	July	8	4	25	6	0	5	11	19	3	8
	August	9	7	19	5	0	4	10	19	2	9
(a) The sensible load equals or exceeds 6.0 Btu per lb of outdoor air and (b) the latent equals or exceeds 6.2 Btu per lb	June	2	3	17	4	0	1	5	23	2	4
	July	7	3	14	6	0	3	11	26	2	6
	August	5	4	6	6	0	3	10	27	2	7
(a) The sensible load equals or exceeds 6.0 Btu per lb of outdoor air and (b) the latent equals or exceeds 4.0 Btu per lb	June	12	5	21	9	0	3	13	27	4	10
	July	18	7	26	13	0	7	18	27	7	13
	August	18	9	22	11	0	7	17	29	5	14

condition is that needed to produce a saturated partial vapor pressure for the temperature of the mixture.

Nonsaturated air gains water vapor from evaporation from a wet surface. Conversely, water vapor is removed from an air-vapor mixture by contact with a chilled surface below the dew point temperature or by contact with an adsorbent.

The partial pressure of the vapor at a surface wet with a liquid is the saturation pressure of the liquid at the surface temperature. If the wetted material is surrounded by nonsaturated air, and if the two are in thermal equilibrium, liquid evaporates from the surface, into the air. This process will continue until the partial pressure of the air reaches saturation or the surface becomes dry.

Vapor migrates from a higher partial pressure to the lower, and no transfer occurs between regions of equal partial vapor pressures. Vapor condenses from an air mixture on a cold surface only when the temperature of the surface is below the saturation temperature corresponding to the vapor pressure of the mixture. Liquid formed by a vapor condensed on a cold surface drains away or is absorbed by a hygroscopic material, since its vapor pressure is less than the partial pressure of the ambient air. The surface continues to extract moisture from the air.

Barrier Reduces Transfer

A material may resist the transfer of vapor from a high pressure region to a lower one to produce a pressure gradient similar to that resulting from a liquid being forced through a capillary tube. Some materials are impervious to the transfer of vapor and offer a complete seal. However, in most construction work, the sealing of joints is usually imperfect, allowing a limited transmission.

Fig. 2 illustrates how a vapor barrier is placed on the high pressure side of a building wall to reduce the vapor pressure below saturation as the cold side of the wall is reached. This is compared to placing a second resistance between the inside barrier and the weather side.

On enclosed cold surfaces, such as pipes, vapor leaking through a barrier collects at the cold surface and condenses since there is no means for its removal. If the seal is nearly perfect, such a small quantity penetrates the barrier that the resulting condensate is absorbed by the material surrounding the pipe without causing injury. ⊣

Neoprene Sleeves Seal Joints in Large Concrete Pipe

. . . held in place by expandable steel bands

NEOPRENE SLEEVES which overlap the joints of concrete pipe solved a serious leakage problem at a Du Pont plant. The neoprene gaskets are held in place inside the pipe by expandable steel bands. Such joints have been in service for more than a year with no leakage or difficulty, although the conventional caulking materials used earlier required frequent repair.

The pipe is a 36 in. supply header for canal water. Before the new gaskets were installed, it had developed about 20 leaks at the joints. Tongue and groove joints sealed with a troweling compound had been used originally. These had failed because the caulking had fallen out of the grooves in many places. The pipe was subject to some vibration from a railroad spur, and this was probably responsible for the joint compound failures.

The first attempt at repair consisted of caulking the leaks with two different types of asphaltic compound and surface primer. Both types began leaking almost at once due to poor adhesion to wet concrete. Finally, a gasket 12 in. wide and ⅛ in. thick was cut out of a neoprene sheet. To hold the gasket firmly in place, steel bands were expanded by tightening jack bolts. ⊣

How Piping Was Designed for

The World's Largest Steam Plant

By Roy E. Lyon

Mechanical Engineer, Design Div., Tennessee Valley Authority

Flows for the various piping systems for the Kingston steam plant, near Harriman, Tenn., were tabulated and velocities and pressure drops were calculated, based on assumed routings. These factors were recalculated after the final routings were established, and adjustments in sizes were made where necessary.

Piping systems for the high temperature, high pressure main and reheat steam, boiler feedwater, extraction, steam, drains, vents, and blowdown, and raw service water were described in the February HPAC. The present article covers compressed air, hydrogen, vacuum cleaning, and oil storage and transfer systems.

Two COMPRESSED AIR systems are in the steam plant, one for general plant service and one for instrumentation. The system for general plant service has four conventional oil lubricated compressors, each rated 660 cfm at 100 psig. A fifth machine of the same capacity is in the yard utility building and is cross connected with the steam plant system so that either system can be made to supplement the other. Five 290 cu ft air receivers reduce cycling of the compressors and pressure variations on the system.

The piping system includes a horizontal loop header above the basement floor with branch lines and risers and 1 in. service outlets at strategic locations throughout the steam plant.

The system for instrumentation is served by four nonlubricated carbon ring compressors. Two of these machines are rated 440 cfm at 100 psig and two are rated 640 cfm at 100 psig. Four 290 cu ft air receivers are used in this system.

From the air receivers, a steel pipe line supplies air to five filter stations in the five unit control rooms. Brass pipe and copper tubing is used for the distribution system after the filters to prevent pickup of scale which would foul the small orifices in the control instruments.

Pipe Hydrogen from Trailers to Generators

In the original installation, standard hydrogen and carbon dioxide manifolds were installed under the generator and around the generator foundation. However, in a plant of this size this storage and handling of a great number of hydrogen bottles is both time consuming and hazardous. Therefore, an outdoor central system supplies all nine units and reduces handling to a minimum.

The system includes two highway transport tube trailers with a capacity of 49,000 cu ft of hydrogen at 2400 psig and 70 F. The trailers, approximately 1000 ft apart, are connected by two 1½ in. underground pipe lines parallel to the transformer yard. Pressure reducing valves in the rear ends of the hydrogen trailers reduce the pressure to 100 psig on the underground piping. From these two lines, two 1 in. branch lines are brought into the steam plant for each two units. These branch lines pass through metering and control stations outside the steam plant wall. The gas is metered at 100 psi pressure and then passes through remotely controlled air operated diaphragm valves, which are operated as required by the unit operators to maintain the desired pressure in the generators. Direct actuated pressure reducing valves are installed between the diaphragm control valves and the generators. These valves are set for the maximum allowable pressure on the generator housing and normally are wide open, all control being done by the diaphragm valves. In case of emergency, however, these valves close to prevent overpressure in the generators.

All piping from the storage trailers to the generators is Schedule 80 steel conforming to ASTM Specification A106 or A83 and is welded throughout. All valves are packless type with stainless steel bellows for 300 psi working pressure. They are welded into the line to minimize leakage.

All underground piping is wrapped with a coal tar impregnated fabric to prevent external corrosion. Piping inside the plant is painted a distinctive color and is well supported to prevent the lines being damaged.

Vacuum Systems Expedite Cleaning

Two vacuum cleaning systems expedite the cleaning of the entire steam plant, service area, and office wing. One system serves the service area, office wing, and Units 1 to 4 of the steam plant. The other unit serves the Units 5 to 9 area of the steam plant.

The vacuum producers are of the rotary type, driven by 15 hp electric motors and are rated 450 cfm at 6.8 in. Hg each. Primary and secondary filters are provided to collect the dirt and dust. From the filters, a piping system was installed throughout the plant with outlets spaced so that the entire plant can be cleaned.

All piping is standard weight steel with cast iron drain-

age fittings to eliminate sharp edges and pockets that would collect dust and lint and plug the lines. Standard vacuum cleaning hose valves are used at all terminal points.

Store and Transfer Three Kinds of Oil

There are facilities for storing, purifying, and transferring three kinds of oil in the plant:

- Turbine lubricating oil.
- Insulating oil for transformers and circuit breakers.
- Light distillate fuel oil for lighting-off pulverized coal burners.

The storage and transfer systems consist of storage tanks, transfer pumps, purifiers for lubricating and insulating oil, and piping systems from storage to point of use.

For lubricating oil, one dirty oil tank and one clean oil tank, each having a capacity of 7770 gal, are in a fireproof room in one end of an intermediate floor between the turbine room and basement floors. The purifier and clean oil transfer pumps are in another fireproof room adjacent to the storage room. The dirty oil transfer pumps are on the basement floor near the turbine oil tanks. A piping system provides for the following operating possibilities.

- Fill either storage tank from railroad car or tank truck, using clean oil transfer pump.
- Pump oil from turbine oil tank to either storage tank, using dirty oil pump near turbine oil tank.
- Transfer clean oil from storage tank to any turbine oil tank, using clean oil pump.
- Take oil from dirty oil tank through purifier and put in clean oil storage tank.
- Circulate oil from either storage tank through purifier and back to tank from which it came.
- Flush piping system with clean oil and return to dirty oil tank.
- Remove oil from system to tank car or tank truck.
- Circulate oil from either turbine oil tank through purifier and back to tank from which it came.

For insulating oil the following equipment is installed:

- One 12,500 gal storage tank for clean oil.
- One 12,500 gal storage tank for dirty transformer oil.
- One 12,500 gal storage tank for dirty circuit breaker oil.
- One 200 gpm clean oil transfer pump.
- One 200 gpm dirty oil transfer pump.
- One oil purifier with a capacity of 1200 gph without the filter press.
- A piping system from the storage tanks to the point of use.

The storage tanks for insulating oil are underground at one end of the turbine room and adjacent to the railroad track serving the turbine room. Each tank is supported at only four points by legs welded near the tank head. The lugs are on independent piers and are anchored to the piers to prevent flotation.

Before the tank pit was backfilled, the tanks were coated with bituminous mastic paint to a thickness of not less than 1/32 in.

An underground piping system throughout the transformer and switchyards has outlet valves near each transformer and circuit breaker for filling and draining the equipment. Flexible oil hose is used for connecting from the header system to the fill and drain valves on the equipment.

The underground piping of 6 and 4 in. diameter wrought iron, is welded. Expansion joints are installed where required. Main sectionalizing valves are plug type, while service outlets are gate valves.

The system provides for the following operations:

- Filling dirty oil tanks from either tank car or tank truck.
- Purify oil from either dirty oil tank and transfer to clean oil tank using pumps on the purifier.
- Filling transformers or oil circuit breakers from clean oil tank using clean oil transfer pump.
- Drain transformers or oil circuit breakers into the appropriate dirty oil tank using the dirty oil transfer pump.
- Remove dirty oil from system using dirty oil transfer pump.
- Remove clean oil from system using clean oil transfer pump.
- Draining and filling electrical equipment in service area on the turbine room floor using appropriate oil transfer pump.
- Flushing piping system with clean oil and return to dirty oil tank.
- Purifying oil in transformers or circuit breakers by circulating oil through purifier without removing equipment from service.
- Purifying oil in clean oil tank by circulating through purifier.

Six 12,500 gal tanks, three 25 gpm pumps, and a piping system store and handle light distillate fuel oil for lighting off the pulverized coal burners.

The fuel oil storage tanks are underground. The pumps are in a separate fireproof room inside the plant. The piping system is welded throughout, using steel valves and welding fittings.

To maintain a constant pressure at the burner operating floor, a diaphragm type backpressure valve is installed at each unit between the oil supply and return lines.

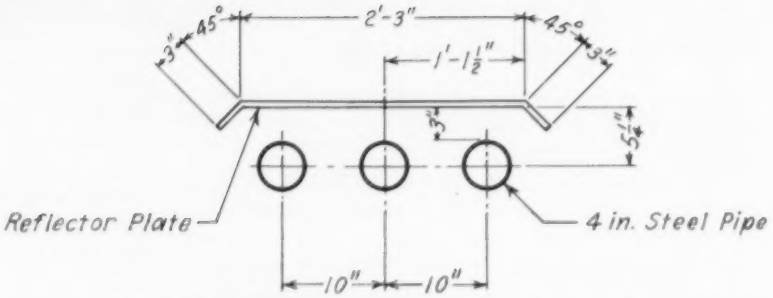
The system provides the following operating possibilities:

- Fill any tank from tank car or tank truck.
- Supply sufficient oil to light off half units in the plant simultaneously.
- Drain any tank into other tanks.
- Remove all oil from system.

All underground piping in the above systems was coated with hot asphalt, spirally wrapped with burlap, and then given a second coat of hot asphalt. ✠

Question of the Month

This question, published previously in HPAC, is repeated here along with answers that have been received from several readers. Two answers have already been published in the November and December 1955 HPAC's. Other comments and answers to the question will also be welcome.



2 REFLECTOR PLATE suspended within 3 in. above bare overhead pipes permits heat emissivity of plate to be predicted

How Can Overhead Pipes

1 OVERHEAD RADIANT PANEL serves strip steel rolling plant building with high pressure hot water at 350 F. Photo courtesy Societe Anonyme Chauffage Sulzer, Paris

"We are planning to install steam pipes overhead in a new plant, and we would like to know the heating results that may be expected if metal reflectors are installed over the pipes, facing downward. We believe that the radiation from these pipes would probably be appreciable in heating the plant, but we have no evidence of information on the results that may be expected.

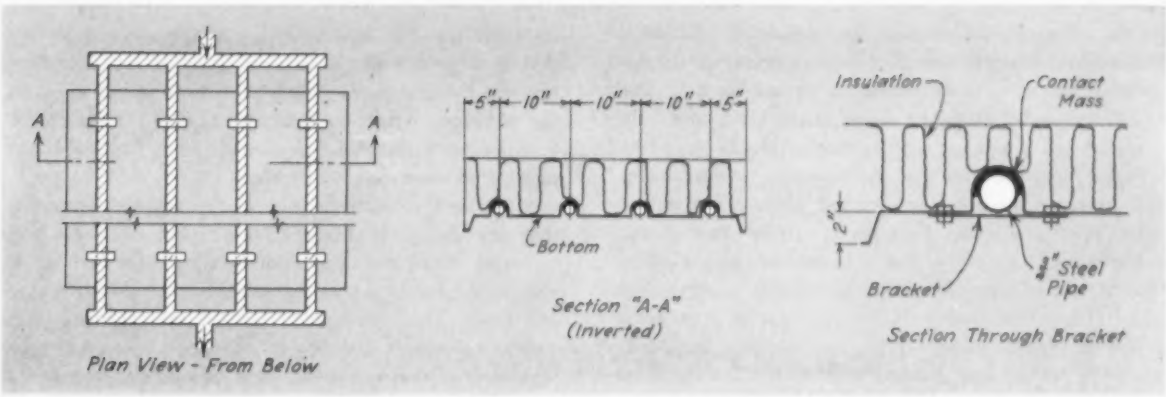
"I would be interested in learning from other HPAC readers what experiences they have had with this method of utilizing waste heat."—J.A.R.

ANTON NIEBERL

RADIANT CEILING heating systems have been built in Germany for several years. Low and medium pressure hot water is generally employed, with forced circulation. The hot water plant can be operated by gravity also. However, in some cases, we used steam.

A basic panel suitable for both hot water and steam is shown in Fig. 3. Steel pipe of ¾ in. diam is wrapped with 18 gage sheet metal for the radiating surface. A bracket presses the pipe into the sheet metal mold. The small space between pipe and sheet metal is filled in with a contact mass for better heat conduction. On the top of the panel is a layer of insulation to reduce the reverse heat emission. When the roof has a high heat loss, then it is advantageous to locate the panel tight to the ceiling and thus create a common roof that consists of panel, insulation, and roof.

The panel should be horizontal, with the edge bent



3 RADIANT CEILING PANEL of ¾ in. diameter steel pipe wrapped in 18 gage sheet metal has more radiating surface and achieves almost twice the radiation capacity of the pipe alone

Be Used To Heat Plant?

down 2 in. to form an inverted trough to prevent heat conduction and flow to the ceiling.

As to the heat emission, we made the overall plain surface of this type of panel equal to the heat load of a low pressure hot water radiator. Hot water was supplied to the panel at 180 to 192 F to obtain a room air temperature of 68 F. Effective heat emission to the room below was 178 Btu per hr per sq ft of panel.

It is important not to have a high velocity air circulation in the room near the panels, or a high tempered air layer will result near the ceiling and reduce the heat efficiency. In a plastic factory where we installed this type of radiant ceiling heating the slightest air circulation could not be permitted. For this reason, we could not locate radiators on the wall, because of the convection currents created in the heated space.

The size of a panel can vary. We built some panels up to 25 ft long and up to 7 ft wide. The size depends on the sheet size.

Reflecting surfaces above the pipes, as shown in Fig. 2, are inefficient in my opinion because the main problem is to create a heat flow from the water — or steam — in the coil to a radiant surface, and in this case this surface is only the surface of the pipe.

In my solution, the U-bend of sheet around the pipe absorbs a higher amount of heat of the pipe by conduction, and then it is conducted to the large radiating surface of the panel. This method achieves almost twice the radiation capacity of the pipe alone because so much more radiating surface is available.—ANTON NIEBERL, Heating Engineer.

C. N. MATTIOLI

THE USE of overhead radiant pipe heating systems for shops is very common in France, as I indicated in my answer in the December 1955 HPAC. Numerous installations can be found dating back 20 years or more.

What puzzles me — and no doubt other American heating engineers is, why should this scheme for heating shops be so common in France and such a rarity in the U.S.?

Of course, radiant heating systems of many descriptions are common in the U.S. today, but these are almost invariably of the mass panel type; that is, where the piping is imbedded in the panel or so closely associated therewith thermally that radiation is from a relatively extensive and massive surface.

The relatively higher fuel costs throughout Europe demand efficient fuel consumption, particularly in industrial installations. Heating shops with overhead pipe does not sacrifice efficiency, even with high level radiation. In fact, the overhead pipe radiation scheme has the same inherent advantages as any other radiant heating system: lower ambient temperatures for the same relative degree of comfort and better vertical temperature gradient. For shop installations particularly, a significant advantage is the more even distribution of heat in the horizontal plane, reduction of drafts and air blasts, and a saving of floor space sometimes used for heating equipment.

These factors do not explain the exploitation of this idea in one country so much more than another. In my opinion, the most overwhelming factor is the extended use of high pressure hot water distribution in France. One of the outstanding advantages of high pressure hot water distribution is the facility of reducing distribution temperature of the prime heating medium in some proportion with decrease in load. Control of direct space heating is thus simplified. A typical overhead radiant piping system would consist of a series of parallel circuits taken off the main distribution lines, with no heat exchanger and no condensate collection

system. A good measure of space heating control is achieved upon regulation of the temperature of the hot water in the distribution mains. A thermostat controlled modulating valve could be installed in the branch line.

The use of steam for such systems presents some temperature control difficulties. Two position — on-off control — would turn the heat on and off as effectively as switching off the lights. Here the "panel" thermal inertia is negligible. Care must also be exercised with modulation control of the steam supply, especially where the initial steam temperature is low. A solution is to form panels of several parallel pipes and cut out lines progressively as the load decreases. The initial impetus of overhead radiant panels fed with high pressure hot water has carried this heating scheme to the point where installations using steam and low temperature hot water are not unusual. One plant uses steam at 10 psig.

In several large airplane hangars, static radiant surfaces are installed, composed of steel pipe with hemispherical reflectors at the level of the lower chord of the trusses. The radiant heat flow assures an acceptable comfort level to men on the ground and to those men working at higher levels. To cut down cold air infiltration, each hangar has several outside air intake unit heaters introducing a quantity of air slightly greater than the air change due to infiltration. Finally, a few unit heaters recirculating air drawn in at the floor level complete the heating demand.

Radiant ceiling panels themselves are simple in design. Most often, there are two or three small diameter pipes in parallel, the diameter depending upon friction drop. Space between pipes could be taken empirically as the distance equal to the perimeter of the pipe. For example, 2 in. pipe would be approximately 7½ in. on centers. The reflector is painted sheet steel. Pipe is rigidly held to the metal reflector, conduction making the reflector an "emittor". The metal reflector thus conducts heat out from the top of the pipe along the reflector where it can be "seen" from below. The exposed top side of the reflector must be covered with insulation to reduce radiation and convection from that surface.

I have run into three methods of calculating panel output. Fundamentally, each method results from application of the Stefan-Boltzmann Law for emissive power, and to the findings of C. W. Rice and others on the natural convection from horizontal cylinders. The various methods of calculation are essentially schemes for cutting out stages of computations by assuming generalizations which hold in most cases and are conservative otherwise. All solutions are based upon the assumption that room air temperature equals the mean radiant temperature of room surfaces.

• *Solution A.* From empirical or experimental data, a chart is derived which indicates top side and underside temperature of the "reflector" for a given difference between pipe and room temperatures. Having the reflector temperature, upward and downward convection and radiation can be calculated. With the upper surface insulated, the top side radiating temperature is so low that it is practically negligible. The heat delivered to occupants below is in effect all the radiating effect of the piping. Convection heat is not lost, as this compensates roof thermal losses and plays the important part of eliminating downdraft.

• *Solution B.* This solution is the simplest, assuming that unit radiation is equal for all pipe sizes and that radiation effect and convection heating effect are equal and in proportion to temperature differences between pipe and room. Thus, one needs to know only the radiation emissive power of, say, 1½ in. pipe and the average pipe temperature to calculate the heat flow to the floor for a given room temperature.

• *Solution C.* This is a compromise between the other two. Here a chart is used to select radiant emission for a given pipe size, pipe temperature, and room temperature. The assumption is made that all radiant emission is downward and is half of the theoretical bare pipe total convection and radiation emission heat flow rates.

The further assumption is made that the reflector converts upward pipe radiation to downward radiant emission and also reduces the bare pipe convection by some 50 percent.

My personal choice is the last solution. Tables showing combined radiation and convection of bare horizontal pipes of various diameters are readily available. A chart of data developed over a quarter of a century ago for a room temperature of 80 F is given in Table 1. This is from data developed by the Americans R. H. Heilman and L. B. McMillan.

Table 1—COMBINED RADIATION AND CONVECTION is shown here for bare horizontal steel pipes, Btu per hr per sq ft of pipe surface per deg temperature difference

Nominal Pipe Diameter, in.	Temperature Difference, F, Surface to Room					
	50	100	150	200	250	300
1	2.03	2.38	2.65	2.98	5.29	5.62
2	1.93	2.27	2.52	2.85	5.14	5.47
4	1.84	2.16	2.41	2.72	5.01	5.55

A computation for a horizontal bare pipe in space will show the logic in the approximation that half the total convection plus radiation emission is radiation.

Assume a 2 in. pipe, of 2.38 in. outside diameter, with a 250 F temperature difference between room and pipe. From Table 1 the total heat emission is 3.14 Btu per hr per sq ft per F. Multiplying this value by 250 F and the area of the pipe, the answer is 447 Btu per hr per linear ft. Fifty percent of this figure indicates an available radiation heat flow rate of 223 Btu per hr.

From the ASHAE Guide, the convection is $0.271 \times (\triangle T/D)^{1/4}$, from which the convection is $(0.271) \times (1250)^{1/4}$ or 1.61 Btu per hr per sq ft per F. Multiplying by the surface area ($0.20 \times 3.14 \times 1$) by the temperature difference (250 F), we obtain 252 Btu per hr per linear ft. The effect of the reflector must certainly cut down the convection transmission because of the insulation on the top side and interference with the upward flow of air currents. Thus, we can accept 252 Btu as the maxi-

mum — unattainable — convection effect of the pipe when in place under the reflector. And consequently, the difference between 447 and 252 Btu, or 195 Btu, is the minimum radiation output.

Using the basic radiation emission law, we can calculate the theorectical emission of the bare pipe in space, assuming emissivity factors of 0.95 to be about 272 Btu per hr per linear ft. This is for radiation in all directions.

We thus can predict that the radiation output lies somewhere between 195 and 272 Btu per hr per linear ft. The assumption of 223 Btu per hr per linear ft falls almost on the mean of these limits. Without precise experimental data for a particular panel design, it seems reasonable to accept the "fifty percent" premise. In any event, this computation method has been used with success for many installations.—C. N. Mattioli, Chief Mechanical Engineer, Ammann & Whitney, Engineers.

G. G. MONTEATH

It is quite a common practice in the United Kingdom to heat inexpensive industrial buildings with overhead pipes, particularly warehouses, storerooms, and the like, where appearance is unimportant and the initial cost is a dictating factor.

The pipes are usually 2 in. to 3 in. standard steel, although finned pipe is frequently used, arranged in a loop around the building perimeter, or sinuous or grid coils, depending on the heating surface required, mounted at heights from 8 ft to 15 ft. No forced convection is used, however temperature gradients are quite high.

The method of determining the linear footage of coil required is to divide the room calculated hourly heat loss by the emission per linear foot of the pipe selected. If the pipes are placed near a wall or ceiling, the emission is approximately 80 percent of a freely exposed pipe.

No reflectors are used with the heating referred to above, although strip type radiant heating is frequently used. These strip panels are installed overhead in the same manner as the pipes and consist of either corrugated aluminum or flat steel sheets with a ¾ in. pipe or pipes rigidly attached to the top or underside. The top of the panel is usually insulated to prevent upward radiation. The manufacturers list ratings for such units.—G. G. Monteath, Mechanical Engineer.

HUGO L. VONREHBERG

The writer concurs with S. R. Higgins — see answer in November HPAC — that the method of radiant heating with steel pipe with metal reflectors over the pipes, as proposed by J.A.R., would be insufficient and uneconomical.

However, if the ceiling of the space to be heated could be properly insulated, then the ceiling itself could be heated by the steel pipes close to it and the ceiling would represent a heat radiating surface with the same effect as if pipe coils were imbedded in the ceiling.

If the heat losses were 50 Btu per sq ft of floor area, and if the ceiling were 10 ft high and insulated, we know from experience that the amount of heat required at the ceiling would be about 30 percent greater, or 65 Btu.

To use bare pipe, as heating elements would be rather costly. But, by using 2 in. steel finned pipe with 5.85 sq ft per lineal ft, this type of heating can be very economical in first cost and in operation. The amount of finned pipe required would, of course, depend on the temperature of the heating medium.

For smaller plants, one line of finned pipe along the periphery of the plant might be sufficient.

For instance, if water at 240 F or steam at 10 psi is used, each lineal ft of 2 in. finned radiation would yield 1680 Btu per hr. This would be sufficient to heat 1680 divided by 65, or 26 sq ft of floor area with 1 lineal ft of finned radiation of one type. The writer has had several years of successful experience with this type of ceiling panel heating.

In recent experiments at the John B. Pierce Foundation, this type of system has been sucessfully used for heating and for cooling during the summer.—Hugo L. vonRehberg, In Charge of Engineering, Braman, Dow & Co.

H. B. WAYNE

This method of utilizing waste heat for plant heating is not practical for many installations. J.A.R. does not indicate if the steam will be generated and transmitted under steady state or transient conditions. The quantity of available heat is a function of steam pressure, temperature, and mass flow rate. If process requirements demand steam having nearly constant thermal properties, any variation in room temperature will partially alter these requirements by inducing changes in the heat quantities transmitted by the reflectors. A change of process needs will influence available heat for comfort heating, thereby providing an unreliable source of energy for this service. During warm weather when comfort heating is reduced or is not required, it will be necessary to insulate the bare pipes and/or provide a bypass to prevent overheating the immediate area.

Calculation of possible heat recovery by installing reflectors will show heat transfer efficiency is not high. Because of the limitations this type of system offers, it is suggested that J.A.R. insulate the process piping and install separate facilities for comfort heating. This will allow maintenance of required room temperature without being influenced by process steam needs.

The savings obtained by having process requirements satisfied at all times and the greater heat transfer efficiency will offset the additional first cost resulting from insulating the process piping and installing separate comfort heating.—H. B. Wayne, Consulting Engineer.

For the new question, turn to page 112

Is Central Station Progress Being Hampered by Lack of Pipe?

"No," say the authors. "Ranges of diameters, wall thicknesses, and lengths are available from one source or another, although no single process fills all the needs." Where deficiencies exist, they review acceptable substitutes.

Here is a frank appraisal of central station piping trends today. This timely subject was presented at the 18th annual American Power Conference last month by the authors in a paper from which this article has been adapted.

By Frank A. Ritchings
Chief Mechanical Engineer

and

Sabin Crocker
Mechanical Engineer

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THE TREND of central station development to larger units for higher pressures and temperatures, and frequently with crossover piping incidental to the reheat cycle, has added to the complexity of piping procurement problems. Conditions have always been rather tight in this field, but difficulties have increased as specified sizes steadily progressed to larger diameters and heavier walls.

How well do available diameters and wall thicknesses of seamless pipe meet actual central station requirements today? What other kinds of pipe can be substituted where deficiencies exist. Answers to these questions depend on such factors as suitability for the service, available lengths, relative cost, promptness of delivery, and willingness of the manufacturer to accept small orders. In view of the present predominant interest in carbon and low alloy ferritic steels for central station piping, the scope of this paper is limited to them and does not include austenitic steels.

Why Seamless Supply Is Limited

The principal features of the different processes and products available are briefly described below for seamless, forged and bored, and welded seam pipe. Data on their available diameters, wall thicknesses, and lengths are given in Table 1. The wall thicknesses of these three principal varieties of pipe as required to suit two typical service conditions are graphically presented in Fig. 1.

The term "seamless" denotes pipe made from solid billets that are pierced and rolled into pipe on a Mannesmann or Pilger mill. Before these processes were developed, "seamless" pipe was made from circular plates in a hydraulic press by pushing the plates through successively smaller dies with a round-nose ram, eventually cutting off the closed end. This process, known as cupping and drawing, is still used to some extent; the product is often referred to as "cupped-and-drawn" pipe to distinguish it from the Mannesmann and Pilger varieties of "seamless" pipe. Several American steel companies have produced one or another of these varieties of "seamless" pipe to a limited extent, but the ranges of diameters, wall thicknesses, and lengths offered are by no means adequate to cover present day central station requirements, in our opinion.

Mannesmann or Pilger mills available in the U. S. for piercing and rolling seamless pipe in light to medium wall for other commercial purposes are incapable of producing anything heavier than Schedule 160 except in a few small sizes and, in fact, do not keep all the dies and mandrels needed for producing a full line of Schedule 160 or even a full line of some of the lighter schedules. So far, American seamless mills in general do not have the piercing and rolling equipment required for producing pipe in a full line of sizes, in weights up to and including Schedule 160. One pipe mill, however, offers "cupped-and-drawn" pipe made by the original seamless method in

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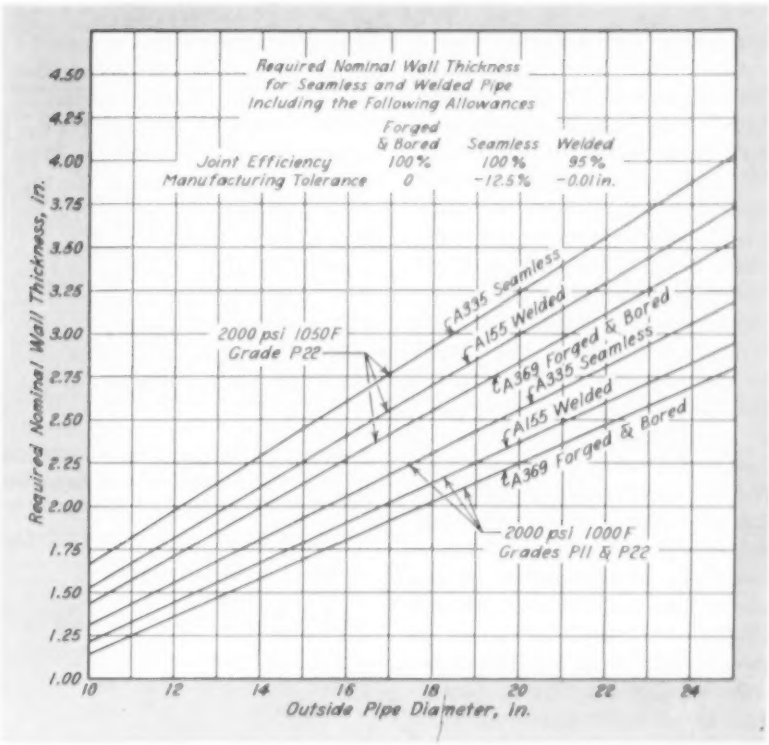


1 WALL THICKNESSES of seamless, forged and bored, and welded pipe are compared here for two typical service conditions

a considerable variety of diameters and wall thicknesses. This process has shortcomings in that available lengths are short and the surface finish, particularly with alloy steel materials, is not as smooth as with other methods. Hence, the fabricators and users of large diameter and/or heavy wall pipe have had to augment the supply by turning to other sources.

Seamless pipe as made in accordance with American Society for Testing Materials Specifications A53, A106, A335, etc., has a manufacturing tolerance on wall thickness of ± 12½ percent.

• see new sources of large diameter, heavy wall pipe

Other kinds of pipe have been produced without welded seams, the two principal varieties being "forged, turned, and bored" pipe and "hollow forged" pipe.

Forged, turned, and bored pipe is furnished to ASTM Specification A369 by a process similar to that used for making naval gun barrels, by forging solid billets to the approximate outside diameter and length of pipe desired, following which the forgings are turned on the outside and bored on the inside to the desired dimensions. Forged and bored pipe is not new, although Specification A369 is of recent vintage. The authors know of its having been used with a 12,000 kw topping unit installed about 1930 in the Deepwater station of Houston Lighting & Power Co., where the main steam line was designed for 1350 psig and 825 F, using flanged joints.

Solid billets for making large diameter forged and bored pipe may weigh as much as 25 tons before turning and boring. Pipe lengths of 30 to 35 ft are possible except in diameters over 24 in., where presently available ingot weights tend to reduce lengths so that 30 in. diameter pipe cannot be produced in lengths over 20 ft. Actual lengths will vary somewhat between manufacturers of this kind of pipe. Lengths up to 50 ft in diameters up to 22 in. have been reported. Wall thicknesses can be machined to anything desired, subject to having a minimum inside diameter of 2½ in. or so needed for passing a boring bar through the pipe. Wall thicknesses possible with this limitation are shown in Table 1. Close tolerances are possible because the product is machined inside and out to specified dimensions. Commercial manufacturing practice as covered in ASTM Specification A369 provides that the wall thickness measured on inspection shall not vary over that specified by more than ⅛ in. There shall be no variation under the specified thickness nor over the specified inside diameter. This kind of pipe can be obtained from several heavy forging manufacturers.

Can Hollow Forge Heavy Walls

"Hollow forging" is the name given by one of the large boiler manufac-

turers to a process recently introduced in its own shop for making water wall and superheater headers. The equipment also is suited for producing large diameter heavy wall pipe which is offered for sale to others. The principal pieces of equipment used are a heavy hydraulic press for piercing ingots and a draw-bench. In this process the ingots are pierced in a vertical hydraulic press, which forges them into hollow blooms having one closed end. The blooms are then placed in a horizontal draw-bench and formed into pipe by pushing them through a series of ring dies by means of an internal mandrel which bears against the closed end. After cooling, straightening, and cutting off the closed end, hollow forged pipe is machined on the outside to specified tolerances. Internal dimensions are maintained within the desired limits by the mandrel in the action of drawing. "Hollow forged" pipe is produced within the same manufacturing tolerances as "seamless," for which the wall thickness variation is plus or minus 12½ percent. This process is particularly suited to making seamless pipe in small quantities and with heavy walls, whereas the Mannesmann seamless process is better suited to making large quantities of light to medium wall pipe.

Basically, "hollow forging" is just another way of producing seamless pipe — or headers — according to specifications such as ASTM A53, A106, or A335. Insofar as the consumer is concerned, the chief differences are: (1) that the manufacturer has tooled up to produce a greater variety of wall thickness than other American pipe mills are equipped to provide; and (2) that the equipment is adapted to quick switching of dies and, hence, is suitable for filling orders of lesser footage, possibly more promptly, than other seamless mills.

Develop Centrifugal Casting

Centrifugally cast steel pipe has been under development for over 10 years but is not yet commercially available for use in central stations. The wellknown success of centrifugally cast cast iron pipe has led to the extension of this process to cylindrical pieces made of carbon and alloy steels as well as nonferrous metals. Hollow shafts have been made in this manner, and other cylindrical articles such as drums, sleeves, and the like. Some centrifugally cast steel pipe has been made for experimental purposes, and specifications for the product have been tentatively discussed. It is understood that the results of certain recent fabrication and service tests are about due for publication. This process seems to offer possibilities, and it is to be hoped that the results of the current experimental work will be encouraging. Whether centrifugally cast steel pipe can be used successfully in the as-cast condition, or whether the material will have to be rolled or extruded or otherwise processed to refine the as-cast structure, remains to be seen. Information so far available indicates that cylinders can be centrifugally cast in lengths up to 16 ft with a wall thickness of 2 in. or more.

TABLE 1—AVAILABLE PIPE SIZES for central station service — diameters, wall thicknesses, and lengths — are shown here for seamless, forged and bored, and welded seam pipe manufactured by various processes

Outside diameter, in.	Nominal wall thickness range, in.			Available lengths, ft[1]							
				Seamless				Welded seam			
				Pierced & rolled	Cupped & drawn	Hollow forged	Forged & bored[2]	Plate pipe shop		Boiler mfr	
	Minimum		Maximum					A	B	A[3]	B[4]
10.75	0.188	to	1.563	35—44	—	—	—	—	—	—	—
	0.750		1.563	35—44	—	18—22	35	—	—	—	—
	1.000		1.500	—	—	—	35	—	—	—	20
	1.000		4.000	—	—	—	35	—	—	—	—
11.75	0.500		1.000	—	19—21	—	—	—	—	—	—
		1.625		—	9	—	—	—	—	—	—
	1.000		1.625	—	—	—	35	—	—	—	20
	0.750		2.125	—	—	18—22	35	—	—	—	—
	1.000		4.500	—	—	—	35	—	—	—	—
12.75	0.219		1.313	35—44	20	—	—	—	—	—	—
	1.500		1.875	—	10—12	—	35	—	—	—	—
	0.500		2.000	—	—	—	—	—	—	15	—
	0.750		2.000	—	—	15—22	35	—	—	—	20
	1.000		5.000	—	—	—	35	—	—	—	—
14.00	0.250		0.937	44	—	—	—	—	—	—	—
	0.438		1.062	—	17—21	—	—	—	—	—	—
	1.250		1.406	—	14—15	—	35	—	—	—	—
	2.000		2.676	—	11—13	—	35	—	—	—	—
	0.312		0.750	—	—	—	—	10—14	14	—	—
	0.500		2.000	—	—	—	—	—	—	15	—
	0.750		2.500	—	—	15—22	35	—	—	—	22—38
	1.000		5.500	—	—	—	35	—	—	—	—
16.00	0.250		1.218	28—44	14—20	—	—	10—20	12—18	—	—
	1.437		2.250	—	8—12	—	35	—	—	—	—
	0.750		2.500	—	—	15—22	35	—	—	15	—
	1.000		2.750	—	—	—	35	—	—	—	24—40
	1.000		6.500	—	—	—	35	—	—	—	—
18.00	0.250		1.156	25—39	12—21	—	—	—	—	—	—
	1.343		2.500	—	9—11	—	—	—	—	—	—
	0.312		1.500	—	—	—	—	20	18	—	—
	0.750		2.750	—	—	—	35	—	—	15	—
	1.000		3.000	—	—	14—22	35	—	—	—	25—40
	1.000		7.500	—	—	—	35	—	—	—	—
20.000	0.250		1.281+	25—43	15—17	—	—	—	—	—	—
	0.375		1.500	—	—	—	—	20	18—20	—	—
	1.125		3.500	—	—	12—22	30	—	—	—	—
	0.875		3.000	—	—	—	30	—	—	15	25—40
	1.000		8.500	—	—	—	30	—	—	—	—
24.000	0.375		0.937	22—41	—	—	—	—	—	—	—
	0.375		1.219	—	10—11	—	—	—	—	—	—
	0.375		1.625	—	—	—	—	20	18—20	—	—
	1.313		4.250	—	—	12—22	30	—	—	—	—
	1.000		3.000	—	—	—	30	—	—	15	25—40
	1.000		10.500	—	—	—	30	—	—	—	—
30.000	0.375		1.375	—	—	—	—	20	—	—	—
	0.375		2.250	—	—	—	—	—	15—20	—	—
	2.750		4.750	—	—	8—20	20	—	—	—	30
	1.000		13.500	—	—	—	20	—	—	—	—

Notes:

[1]Values shown are maximum length ranges in reverse order for the wall thickness ranges tabulated at left, viz. the shorter lengths go with the heavier walls.

[2]Actual lengths will vary somewhat between the several manufacturers of forged and bored pipe. Lengths up to 50 ft in diameters up to 22 in. have been reported.

[3]Made with one longitudinal seam.

[4]Made in halves with two longitudinal seams.

• await further experience with welded seam pipe

Electric fusion welded steel pipe for high temperature and/or high pressure steam plant service is made to ASTM Specification A155. Plate material is formed into cylinders, following which the longitudinal seam is fusion welded by an electric process that deposits filler metal. Class 1 pipe is heat treated and radiographed, whereas Class 2 is not radiographed, and the requirements for heat treatment depend on the wall thickness and composition of the plate. Fusion welded pipe has a wall thickness within the tolerance of the specification to which the plate is bought, usually −0.01 in., plus about 3 to 5 percent.

Electric welded plate pipe and headers are not new. ASTM Specification A155 for "Electric Welded Steel Pipe for High Temperature Service" was first published as tentative in 1934 and adopted as standard in 1936. This specification has been referenced through the years by the American Standard Code for Pressure Piping. Although Specification A155 is not referenced in the ASME Boiler Construction Code, the omission is considered a technicality arising from the fact that the welding is not conducted under Boiler Code inspection. Similar headers or pipe can be manufactured under Boiler Code rules and inspection; in fact the A155 Class 1 product with the welded seam radiographed does qualify under the Boiler Code if inspected according to its rules. The Boiler Code has permitted welded drums for some 25 years.

A155 welded seam pipe has been used to some extent for "hot" and "cold" reheat piping in central stations in diameters of 16 to 24 in. or so, and wall thicknesses of the order of ½ to 1½ in. This light to medium wall material is fabricated in plate pipe shops. As stated in the scope of A155, this pipe "shall be suitable for bending, flanging — van stoning — corrugating, and similar forming operations." Actually, such forming operations severely tax the properties of any pipe, and the fact that considerable quantities of A155 pipe have been successfully hot bent for use in reheat piping is an encouraging indication of its quality. But aside from the high quality of this particular product, any welded seam pipe has inherent disadvantages for high temperature piping applications in comparison with the seamless variety as discussed hereinafter.

Since 1950, two of the principal boiler manufacturers have started making the equivalent of A155 pipe for use as furnace wall and superheater headers, and more recently they have offered their product for sale as pipe. This material ranges in size from 10.75 to 30 in. OD and is on the medium to heavy wall side. The principal systems where these thicknesses might be used in central station piping are main steam and boiler feed. Obviously, the criteria for acceptability here are even more rigorous than those obtaining for reheat piping.

The difference in thickness range of the products produced by these boiler manufacturers as distinguished from the plate pipe fabricators is due to the fact that the boiler people form heavy plate into cylindrical shape between dies in a hydraulic press, whereas the pipe fabricators form light to medium plate into cylindrical shape over rolls. Once formed, the processes of welding, heat treating, and radiographing are much the same. Thus, these two variations of A155 pipe are complementary, although they do overlap to a certain extent in the medium-weight field.

These boiler manufacturers can form heavier wall thicknesses with A155 pipe by pressing than the plate pipe fabricators can by rolling. While their product is acceptable for drums and headers, its suitability for severe service conditions in central station piping is open to question, at least until satisfactory performance is demonstrated through actual use.

Welded seam pipe differs from any variety of seamless pipe, including "hollow forged" and "forged and bored," in several respects. There are both advantages and disadvantages characteristic of the different types, but in all cases the presence of a welded longitudinal seam introduces certain problems that are nonexistent with the welded line joints — girth seams — commonly used in assembling all varieties of steel pipe. These problems are accentuated at elevated temperatures or where appreciable thermal expansion takes place.

First, a longitudinal seam is subjected to twice the stress due to internal fluid pressure that a line joint has to support. Also, line joints often can be located where they are not subjected to the maximum bending moment due to thermal expansion, although this possibility diminishes as pipe lengths decrease. Further, where a line joint can be located in a straight run of pipe, it operates under more favorable conditions than does a longitudinal seam which runs through bends as well. Any curved pipe such as a bend is subjected to severe localized bending stresses due to expansive movement which do not exist in straight pipe. These localized stresses result from the tendency for the circular cross section of the pipe in a bend to flatten — become oval — during flexure, thus causing additional stresses to act on the seam.

Where pipe is bent during fabrication, it might be reasoned on the strength of past experience that seamless pipe is preferable to any kind of welded seam pipe on the grounds that either hot or cold bending subjects the seam to unequal strains which might cause cracking or even split the weld. How true this is for high grade electric weld pipe needs to be weighed after more experience is had with this product.

Under conditions where there is a tendency towards graphitization in the heat affected area adjacent to a weld, the difficulty of effecting repairs by cutting out the graphitized area or by solution treatment might be greater in a longitudinal welded seam than in a girth joint. Also, there would be more weld to repair than if the pipe were seamless. Were

the whole piping system to be replaced, however, these considerations would not be a factor.

Therefore, it will be of interest to await the results of further experience with welded seam pipe in central station service. Pending longer use of the product in the form of bent pipe in reheat lines, consideration might be given to trying it out in straight runs of main steam lines with forged or seamless welding elbows instead of pipe bends. Another way to avoid placing welded seam pipe in bends subject to expansive movement is to have a floating superheater outlet header on a boiler with the turbine placed so as to need only a short run of straight pipe between it and the superheater outlet. This has been done in at least two installations during the past 15 years. What is saved in the cost of piping, however, tends to be offset by increased boiler costs.

With drums or headers, the existence of a welded longitudinal seam is not a problem, principally because they are used as straight cylinders and neither bent during fabrication nor flexed in curved form in use. Attention is called, however, to paragraph P104(e) of the American Society of Mechanical Engineers Power Boiler Code, which reads: "The design of welded drums and shells shall be such that the bending stresses are not brought directly upon a welded joint." This prohibition is even more pertinent with a curved member like a pipe bend than it is with a straight cylinder such as a drum or header. Nevertheless, with headers and drums it would seem advisable to see that pipe nozzles, which might transmit bending moments, are located where they do not straddle welded seams.

What Are Joint Efficiencies?

The joint efficiencies applicable to welded seams in drums or headers provided in the Boiler Code, and to ASTM Specification A155 for "Electric Fusion Welded Steel Pipe for High Temperature Service" in the Piping Code ASA B31.1-1955 are:

- *ASME Power Boiler Code — Section I* — 1952. Paragraph P-102: "In applying the rules in paragraph P-180 — containing the formula for computing the wall thickness of drums or headers, — a welded joint efficiency of 95 percent may be used, provided all weld reinforcement is removed substantially flush with the surface of the plate, (in order to get a more clean cut radiograph). Otherwise, a joint efficiency of not to exceed 90 percent shall be used."
- *Code for Pressure Piping, ASA B31.1-1955.* Footnote 3 of Table 2a entitled Allowable Stresses for Pipe in Power Piping Systems: "The allowable stresses — S-values — tabulated are for A155 Class 2 pipe on the basis of 90 percent joint efficiency. For Class 1 pipe which is heat treated and radiographed, these stresses may be increased by the ratio of 95 divided by 90."

• differences between seamless, welded are qualitative

Fusion welded pipe made from plate has certain inherent differences from seamless pipe with respect to manufacturing tolerances on wall thickness, presence of surface defects such as slivers, scores, scratches and abrasions, susceptibility to hidden defects such as laminations and slag inclusions. Except for wall thickness tolerances, these differences are qualitative rather than quantitative. The following observations may be of interest:

- *Wall Thickness Tolerance.* Seamless pipe has a "nominal" wall thickness with a ± 12½ percent manufacturing tolerance. "Hollow forged" pipe is made within the usual seamless tolerances as stated in ASTM Specifications A106, A335 etc.

Forged and bored pipe is machined to specified dimensions. The wall thickness measured on inspection shall not vary over that specified by more than ⅛ in. There shall be no variation under the specified thickness nor over the specified inside diameter.

Fusion welded pipe has a wall thickness within the tolerance of the specification to which the plate is bought, usually −0.01 in., plus about 3 to 5 percent.

- *Surface Defects.* Seamless pipe in general seems more susceptible to acquiring surface defects in the process of piercing and rolling than is experienced in rolling plate. Hence, seamless pipe specifications contain more extensive requirements than specification A155 does to govern the extent of surface defects that will be accepted and their repair by chipping and welding where permitted. Plate material has a further advantage in that it can be inspected and repaired on both sides before making it into pipe, whereas repair to seamless pipe is pretty much limited to the outside. Whether "hollow forged" is better or worse than other seamless pipe in this respect remains to be seen after more experience with the product.
- *Laminations and Slag Inclusions.* The extent of laminations and slag inclusions experienced with either seamless or plate pipe depends largely on how generously the ingots or billets are cropped before rolling. Where laminations come to the end of seamless pipe or to the edge of plate material, they can be readily detected and the material rejected or cropped as circumstances warrant. Plate material has the advantage of having more edge material open for inspection than has seamless pipe. Further examination of either product can be carried out by ultrasonic testing where agreed. Experience so far with plate pipe seems to indicate more trouble with hidden laminations than is experienced with seamless.

Several Factors Affect Cost

The subject of cost can be discussed here only in relative terms. Generally speaking, the cost of most varieties of seamless pipe is not far different from that of pipe formed

TABLE 2—MAIN STEAM PIPE COST RATIOS are spot compared here for three sizes of material made by various processes for a 250 ft run designed for 2015 psig and 1015 F. Material is Grade P11 ferritic steel containing 1¼ percent chromium and ½ percent molybdenum. Cost ratios are based on estimates which include cost of pipe at the mill with a 12½ percent fabricator's handling charge, plus the cost of making the number of line welds needed for assembling the respective number of lengths of pipe into a 250 ft continuous line. Omitted are freight, hangers, insulation, erection

Outside diameter, in.	Kind of pipe	Seamless		Forged & bored	Welded seam	
		Cupped & drawn	Hollow forged		One seam variety	Two seam variety
	ASTM specification No.	A335	A335	A369	A155	A155
12.75	Av. length, ft & in.	18-3	21-0	35-9	14-9	19-3
	No. of lengths	14	12	7	17	13
	No. of welds included	15	13	8	18	14
	Minimum wall, in.	1.575	1.575	1.575	1.645	1.645
	Nominal wall, in.	1.813	1.813	1.575	1.656	1.656
	Cost ratio to least expensive	1.26	1.00	1.65	1.35	1.60
14.00	Av. length, ft & in.	15-0	21-0	35-9	14-9	19-3
	No. of lengths	17	12	7	17	13
	No. of welds included	18	13	8	18	14
	Minimum wall, in.	1.720	1.720	1.720	1.795	1.795
	Nominal wall, in.	2.000	2.000	1.720	1.813	1.813
	Cost ratio to least expensive	1.36	1.00	1.64	1.32	1.57
18.00	Av. length, ft & in.	8-9	21-0	35-9	14-9	25-0
	No. of lengths	29	12	7	17	10
	No. of welds included	30	13	8	18	11
	Minimum wall, in.	2.195	2.195	2.195	2.290	2.290
	Nominal wall, in.	2.500	2.500	2.195	2.313	2.313
	Cost ratio to least expensive	1.50	1.00	1.72	1.16	1.05

from plate and having an electric fusion welded seam that is radiographed. Both kinds contain about the same amount of steel, and the cost of piercing and drawing seamless from a solid billet seems to come somewhere near matching the cost of forming plate into cylindrical form, welding the seam and radiographing it.

Forged, turned, and bored pipe, however, is manufactured by an inherently wasteful process. After a solid billet is forged to approximately the desired diameter and length, much of the interior of the billet is reduced to scrap in the form of chips from the boring operation. The thinner the desired wall thickness, the greater the wastage and hence the higher the relative cost.

In comparing costs for different kinds of pipe it is necessary to take into account the maximum lengths obtainable by the respective processes inasmuch as shorter lengths require more line joint welds during fabrication and erection. Maximum lengths available by the different processes are shown in Table 1.

The relative costs shown in Tables 2 and 3 for main steam and reheat piping respectively were derived for typical 250 ft runs of pipe based on recent costs of pipe at the manufacturer's mill or shop, plus allowance for line joint welds made in the shop or field for assembling the respective number of lengths into a 250 ft run. The service conditions chosen for Table 2 correspond to the main steam line for a large turbine having throttle conditions of 1800 psig and 1000 F; those for Table 3 correspond to the hot reheat piping for the same unit operating at about 600 psig and 1000 F. In comparing these cost ratios, two things should be remembered: (1) this is only a spot comparison for a few sizes of pipe of one material and (2) cost ratios will change from time to time, depending on demand for the respective products.

TABLE 3—HOT-REHEAT PIPE COST RATIOS are spot compared here for three sizes of material made by various processes for a 250 ft run designed for 600 psig and 1015 F. Material is Grade P11 ferritic steel containing 1¼ percent chromium and ½ percent molybdenum. Cost ratios are based on estimates which include cost of pipe at the mill with a 12½ percent fabricator's handling charge, plus the cost of making the number of line welds needed for assembling the respective number of lengths of pipe into a 250 ft continuous line. Omitted are freight, hangers, insulation, erection

Outside diameter, in.	Kind of pipe	Seamless ASTM A335		Welded seam ASTM A155			
		Pierced & rolled	Hollow forged	Plate pipe shop		Boiler mfr	
				A	B	One seam	Two seam
16.00	Av. length, ft & in.	26-0	25-0	19-4	19-4	14-9	31-3
	No. of lengths	10	11	13	13	17	8
	No. of welds included	11	12	14	14	18	9
	Minimum wall, in.	0.702	0.702	0.731	0.731	0.731	0.731
	Nominal wall, in.	0.843	0.843	0.750	0.750	0.750	0.750
	Cost ratio to least expensive	1.05	1.12	1.66	1.00	1.41	1.45
24.00	Av. length, ft & in.	—	25-0	19-4	18-0	14-9	35-9
	No. of lengths	—	11	13	14	17	7
	No. of welds included	—	12	14	15	18	8
	Minimum wall, in.	—	1.021	1.069	1.069	1.069	1.069
	Nominal wall, in.	—	1.218	1.079	1.079	1.079	1.079
	Cost ratio to least expensive	—	1.27	1.41	1.00	1.25	1.19

Welded Seam May See More Use

Cost differences and procurement difficulties experienced in obtaining some varieties of seamless — including forged and bored — pipe needed for central station use point the need for encouraging all promising new sources of supply and for giving full consideration to other reasonably acceptable kinds of pipe. The following possible uses of electric fusion welded pipe are suggested as being reasonably promising for further consideration:

- Reheat or similar weight piping, possibly using seamless or forged elbows instead of pipe bends where expansion stresses are particularly severe.
- High pressure boilerfeed piping beyond the scope of seamless pipe — except forged and bored — using forged fittings instead of pipe bends.
- High pressure, high temperature main steam lines where the pipe is placed in straight runs not subject to high bending moments.

These suggested uses are inclined toward the cautious side until further experience is had with the product. If fabrication and service reports continue to indicate satisfactory performance in severly stressed locations such as pipe bends, and if other forming operations prove successful, more confidence in its use will naturally ensue. ✠

To Size Ducts Adequately

Select the Right Pressure Drop

By Vincent J. Turecamo
Consulting Engineer

Sizing ducts by the equal friction method requires finding the correct friction loss or pressure drop.

To APPLY the equal friction method for sizing ducts, the pressure drop to be used must first be determined. The means for selecting the proper friction loss is not clearly understood, unfortunately, and frequently an arbitrary value is assumed, regardless of the air flow rate in the system.

The design staff of a large building firm was notified recently that all supply duct systems were to be sized on a pressure drop of 0.08 in. of water gage and all exhaust systems on 0.06 in. WG.

Such a selection, of course, is not recommended—not while there is a simple and practical method that can be used to accurately derive the correct drop for any given system. This method is based on the selection of the maximum and minimum velocities.

The formula, $V = 466h^{0.54}Q^{0.24}$, was derived in order to show clearly the relationship between pressure drop, velocity, and air flow rates. Derivation of this formula is shown in the accompanying box.

Shows Velocity Drop

The figure illustrates the formula's application over a wide range of values. Note that a velocity drop occurs as higher to lower values of air flow rate are reached, and that moving from right to left along any line of equal friction shows a gradual drop as lower air flow rates are reached.

Moreover, movement along any line of equal air volume with an increase in friction loss shows the velocity to change slowly for smaller air flow rates and rapidly for higher ones.

For example, at 2000 cfm the velocity increases only by 600 fpm in moving from 0.04 to 0.16 in. WG, while at 20,000 cfm the velocity increases by 1000 fpm for the same increase in friction loss. Most important is that with a constant friction loss the velocity is fixed for any given air quantity. This does not happen when the velocity method is used, since the designer can select the desired velocities in the mains and branches. So, care must be taken to choose the drop that will yield the optimum velocities at the various points in the system.

Select Optimum Velocity

Noise level, economy, and efficiency are three factors governing the optimum velocity for a given condition.

Obviously, the noise level of the air in a duct has to be lower than that of the area it serves. Since the sound intensity is directly proportional to the velocity of the air,

• *here's how the basic formula was derived . . .*

The formula for air flow is, of course:

$$p = f\,(L/D)\,(V^2/2g) \quad \ldots\ldots(1)$$

where p = air pressure drop, ft; f = friction factor; L = length of pipe, ft; D = diameter of pipe, ft.

Substituting the velocity head in inches of water gage for the velocity head in feet:

$$p_a = f\,(L/D)\,[(V/4005)^2] \quad \ldots(2)$$

Now, p_a is the pressure drop in inches of water gage and V the velocity in feet per minute.

To eliminate the diameter, the formula, $Q = VA$, or:

$$D = 1.13\,\sqrt{Q/V} \quad \ldots\ldots\ldots\ldots(3)$$

is used. Q is the air quantity in cubic feet per minute.

Using this value for D in the flow equation and assigning to L the value of 100 ft:

$$h = [100/1.13\,(4005)^2]\,f\,(V^{2.5}/Q^{0.5}) \quad \ldots\ldots\ldots\ldots(4)$$

So, h has become the pressure drop in inches of water gage per 100 ft of duct.

The friction factor, f, depends on the Reynold's number and roughness factor. Nevertheless, for standard air with a kinematic viscosity of 1.62×10^{-4} ft^2 per sec and a roughness factor of 0.0005, the friction factor can be expressed as a function of the air flow in cubic feet per minute. The following equation is reasonably accurate:

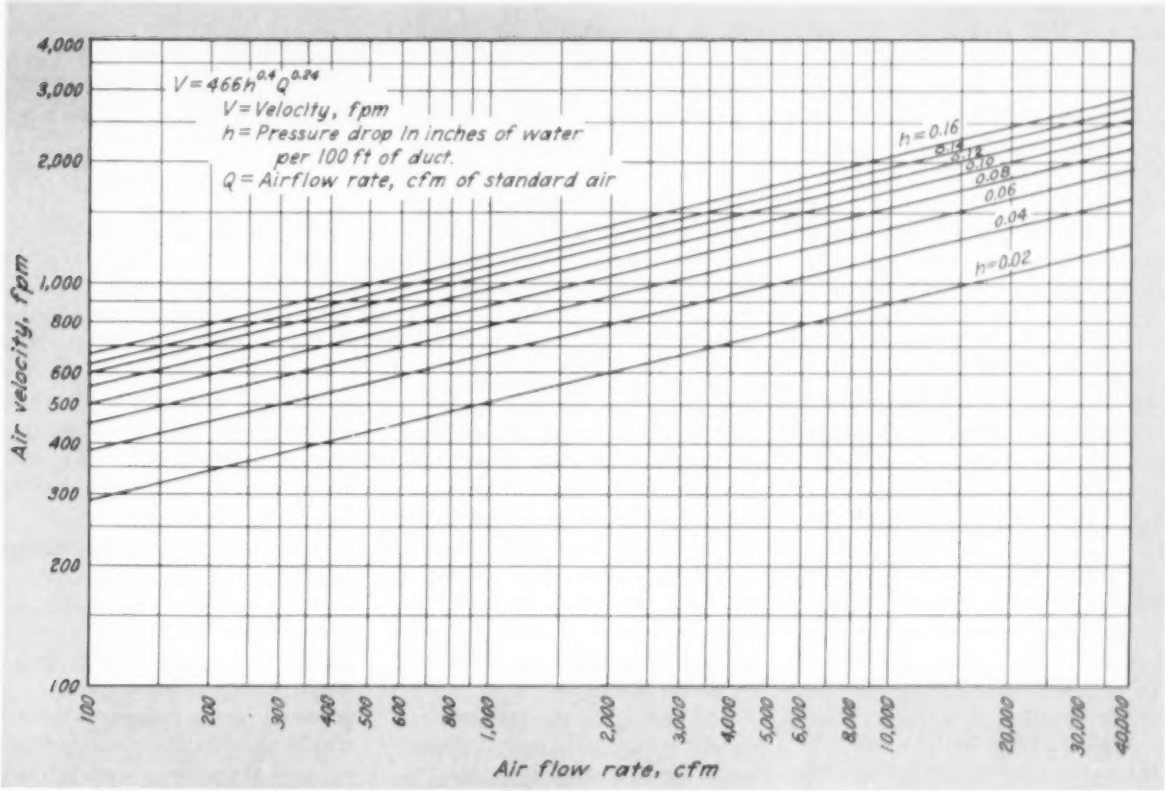
$$f = 0.0386/Q^{0.10} \quad \ldots\ldots\ldots\ldots(5)$$

Substituting this for f in the flow equation:

$$h = [(100 \times 0.0386)/1.13\,(4005)^2]\,(V^{2.5}/Q^{0.5}) \quad \ldots(6)$$

Solving, at last:

$$V = 466h^{0.54}Q^{0.24} \quad \ldots\ldots\ldots\ldots(7)$$



APPLICATION OF THE FORMULA for determining the correct pressure drop for any given system shows a velocity drop as higher to lower air quantities are reached.

suitable velocities must be maintained not only in the duct system itself, but also at the fan outlet.

In marine and industrial installations, noise level is not so important. Here, economy usually governs the velocity range. But even in these installations, velocities must not exceed certain limits and require special ductwork that may offset the economy gained from using higher velocities. Lately, the desire for space economy has encouraged the use of velocities as high as 3500 fpm, using sound absorbing materials on installations in commercial buildings.

Efficiency is usually the determining factor in industrial exhaust systems used for conveying particles of various sizes and weights. With these, the required capture velocity is of the greatest importance.

The experience and sound judgment of the competent designer actually govern the selection of these velocities. Each installation is different, and the designer can only use the noise, economy, and efficiency elements and their flexibility as guides in making his selection.

Consider Basic Velocities

Only two basic velocities need be considered in choosing pressure drop. These are the initial or maximum, occurring at the fan outlet, and the final or minimum, occurring at the end of the longest duct. At any other point in the system the velocity is intermediate and must fall on the equal friction line for the system.

As an example, if the required air quantity for a given system is 15,000 cfm and it is desired to maintain an initial velocity at 1500 fpm and a final velocity that will not fall below 675 fpm or an air flow rate of 500 cfm, then from the curves it is apparent that a pressure drop of 0.06 in. WG per 100 ft will satisfy this condition, and all other velocities must fall on the equal friction line of 0.06 in. WG.

4 Velocity Ranges Explained

The table gives velocities corresponding to four main conditions in common practice. The ranges are arbitrarily named as low, average, mean, and high.

The low velocity range is used mainly for small buildings or on systems requiring a low noise level. The average range is the one most commonly used and is applied principally to commercial, institutional, and public buildings. The mean

TABLE—VELOCITIES given for conditions in common practice, fpm

Range	Fan Outlet Velocity	Maximum Initial Velocity	Minimum Final Velocity
Low	1100	900	400
Average	1700	1500	600
Mean	2100	1900	800
High	Up to 4000	Varies	Varies

range is about halfway between the low and high ranges and is applicable to ductwork wherever noise is no factor. The high velocity range is used for industrial exhaust and pneumatic conveyor systems and also for supplying air to induction convectors.

The velocities given in the table are merely a guide and also must be supplemented by good judgment. A tolerance of ± 100 fpm on each velocity range to suit variable conditions can be assumed. The following examples illustrate the selection of the pressure drop for the ranges given in the table.

Example 1 — Low Velocity

Problem: Select the pressure drop for a duct system in the low velocity range if the air flow rate is 5000 cfm. Check the final velocity if the air volume at the end of the longest run is 200 cfm.

Solution: From the table select the following velocities: fan outlet, 1100 fpm; initial, 900 fpm; final, 400 fpm. From Fig. 1 the pressure drop for 5000 cfm at 900 fpm is close to 0.03 in. WG per 100 ft. The final velocity for 200 cfm at 0.03 in. WG is about 400 fpm, which is satisfactory. Therefore, size the duct system on 0.03 in. WG and select a fan with an 1100 fpm outlet velocity.

Example 2 — Average Velocity

Problem: The air conditioning system for an office area requires an air flow rate of 20,000 cfm. Select the pressure drop and check the final velocity if the air quantity at the end of the longest run is 500 cfm.

Solution: From the table select the following velocities: 1700 fpm at the fan outlet, 1500 fpm as the initial velocity, and 600 fpm as the final velocity. From the curves the pressure drop for 20,000 cfm and 1500 fpm is 0.05 in. WG. The final velocity for 500 cfm at 0.05 in. WG is about 620 fpm, which is satisfactory.

Example 3 — Mean Velocity

Problem: A duct system in an industrial plant is to supply 30,000 cfm. In this case, the air quantity at the end of the longest run is 1000 cfm.

Solution: The table gives the following velocities: fan outlet, 2100 fpm; initial 1900 fpm; final at duct outlet, 800 fpm. The curves show the pressure drop for 30,000 cfm and 1900 fpm to be 0.07 in. WG. The final velocity for 1000 cfm at 0.07 is about 850 fpm, and is satisfactory.

Example 4 — Mean Velocity

Problem: A factory to be heated by warm air requires 10,000 cfm. For projection heating of the area the neck velocity of the diffusing outlets must be about 1500 fpm. The air velocity in the duct cannot be less than 1300 fpm. Determine the pressure drop to be used, with the air quantity of 2000 cfm at the end of the longest run.

Solution: From the table the fan outlet and initial duct velocities would be 2100 and 1900 fpm, respectively. The minimum final velocity in this case is 1300 fpm, as required. From the curves the pressure drop for 10,000 cfm and 1900 fpm is 0.14 in. WG. The final velocity for 2000 cfm at 0.14 in. WG is about 1300 fpm, again satisfactory.

Consider Air Distribution

The problem of air distribution is another important factor in evaluating the pressure drop. A rigid application of the equal friction method would require that the total pressure through any branch be equal to the total pressure in the trunk duct. However, such a method cannot be applied since the velocity in the branch ducts might become too great.

Using a slightly higher pressure drop for 100 ft for the branches is a partial solution, provided that the increased pressure drop does not result in velocities above the desired maximum. Nevertheless, whether one or more pressure drops are used, the same general rule applies, and that is: select the pressure drop that will give optimum velocities for a given system. ⌗

READER ASKS—

"What's the Best Way to File Technical Articles and Data?"

"I know this question has been asked before as HPAC's Question of the Month, and I have read answers to it which have been helpful. I have used some of the ideas, but I still haven't found the system to answer all my needs.

"What I would like to know is the best way of filing, in a small engineering office, technical information from articles in *HPAC* and other magazines; data from manufacturers of equipment used in heating, piping, and air conditioning work; and ideas and data from other sources.

"By 'the best way of filing,' I mean the method that takes the least time and trouble not only to put the data in the right place originally but to find it when it's wanted."—G.W.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2. For this month's question with answers,* *turn to page 100.*

The Law and Your Profits

By William Hurd Hillyer

Authority Must Back Signature

Court upholds contract signature of supply firm's president and general manager on principle of "implied authority." As a result, the firm loses case to contractor suing under contract's guaranty provisions. However, contractor was lucky. If court had regarded contract unusual, or if contract had been disavowed by firm's board of directors, outcome would have been doubtful. Therefore, to be safe, contractor should have obtained formal approval of the board.

THE EXTENT of power possessed by the officer of a corporation is something to be gone into before his signature is accepted on a contract. The following case, in which all names are fictitious, clarifies this point and presents several intriguing angles.

The Hillandale Building Corp., organized to develop a large project, entered into an "agreement and guaranty" with an independent contractor, Con Du Witt, covering necessary piping and allied material.

A year later Skild E. Rector with four associates formed Edifice, Inc. to take over Hillandale Building Corp., including its contract with Con Du Witt. A new contract, identical in wording with the first — even to its year-old date — but differing as to amount, was executed by Rector as president of Edifice.

Edifice contracted for 123 installations but only 14 were ever possible. Months went by. Finally Du Witt sued Edifice for breach of written contract by its president and for anticipated profits which he would have received on the remainder of the 123 units. He obtained judgment in the trial court. The building company appealed on the ground that, despite the payment of checks drawn for storage of piping material and signed by one or more of Rector's corporate associates, he had no authority to execute such contract with Du Witt in behalf of Edifice, Inc.

The state supreme court in its opinion conceded that according to evidence the Edifice directors knew nothing of their president's having signed the Con Du Witt agreement. Consequently, the question, as seen by the higher tribunal, boiled down to whether Rector possessed "implied authority" to enter into that contract in behalf of Edifice, Inc.

Testimony was reviewed at length establishing the fact that, while the contract was discussed and one or more of the directors opposed its "guaranty" provisions, there was no record of the board of directors having disavowed the agreement. Furthermore, it transpired from the testimony that Rector was more than just president. He was general manager in charge of construction. It was his responsibility to have the project built, and it was incumbent on him to see that the requisite materials were forthcoming. It must be apparent, said the court, that there would have to be a supply of equipment on hand "for necessary installation as required."

The justices were convinced that the plaintiff Du Witt met the burden of proof to show Rector's implied authority. Citing pertinent decisions, the court set forth as a well established principle that "authority of the president or of the manager of a business to bind a corporation by contracts made in its name or behalf need not be shown by formal note of its board of directors. . . Unless the authority is specially restricted," he will be presumed, in the absence of proof to the contrary, to have authority "to enter into contracts relative to matters arising in the usual or general course of the corporate business . . . Even if it be conceded, which we do not," the court continued, "that the guaranty portion of the contract was beyond" Rector's authority, "yet we hold that where a portion of the agreement was legal . . . then recovery could be had" on that portion.

Based upon these findings the supreme court upheld the trial court's decision in favor of Du Witt. As often happens in "borderline" cases, the contractor was lucky. It chanced that the courts chose, in weighing the evidence, to regard the subject contract as usual, proper, necessary, and ordinary, though it possessed some unusual and perhaps extraordinary features. Furthermore, the outcome would have been doubtful if the contract had been disavowed by a vote of the directors, even without Du Witt's knowledge. His position would have been much safer if he had as contractor obtained the formal approval of the board. ⊣

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

COAL:

Covered concisely in this article are current estimates of coal reserves by various agencies, the distribution of reserves, their mining characteristics, and some of the potentials and implications involved in future coal production.

For simplicity, coal reserve data is condensed wherever possible into four regions: (1) the Appalachian trough, extending from western Pennsylvania to northern Alabama, including only the eastern part of Kentucky; (2) the Eastern Interior region of Illinois, Indiana, western Kentucky, and Michigan; (3) the Western Interior region, extending from Iowa to Texas; and (4) the Far Western region, including the coal deposits of the Rocky Mountain fields, the adjacent High Plains immediately to the east, and the scattered deposits along the Pacific coast.

By Clayton G. Ball

President,

Paul Weir Co., Inc.

IF THE PREDICTIONS of greatly increased demand for coal within the next 20 years are true, the question of where the increased production will come from assumes tremendous importance. I believe coal reserves are ample to satisfy even greatly increased demand. However, no matter what the final total amount may be, any large increases in rates of production at present producing fields will cause a rapid transition of mining either into new districts or to adjoining areas of probably inferior characteristics.

The combined effect of the various inter-related factors involved will result, I believe, in the location of some industries in areas quite separate from the major producing fields today. Already, the high demands for high quality coking coals for byproduct furnaces and for low cost coal for steam plant boilers and other uses are bringing about some significant shifts of coal supply and utilization.

Definitions of reserves, maximum or minimum limitations of occurrence of reserves, and even the viewpoints between different authorities vary so widely that direct contrasts in reserves are often relatively meaningless. Therefore, we are concerned here with relative magnitude and potentials rather than finite amounts.

One distinction that must be kept in mind, however, is the difference between reserves in place and reserves recoverable by some present or future method of extraction. The terms used here are intended to be descriptive, as implied in the word itself, rather than as carefully defined in the numerous sources of information.

• U.S. Geological Survey

Coal reserves of the U. S. recently have been studied and reappraised by several agencies. Among the current estimates are those of the U. S. Geological Survey, the U. S. Bureau of Mines, Kansas, Illinois, and Ohio state surveys, and the nationwide survey of synthetic liquid fuel potential, requested by the Synthetic Fuels Branch of the U. S. Bureau of Mines.

The most comprehensive information has been assembled by the U. S. Geological Survey, the greatest authority on the subject. Curtailed for many years by insufficient funds, the federal survey has but recently been able to begin to reappraise many long established estimates of coal reserves, state by state.

According to its most recent countywide summaries of coal resources —Circular 94, published November 1, 1950, and Circular 293, dated October 1, 1953—the total reserves of all ranks of coal were 2.4 trillion tons in 1950 and 1.9 trillion tons in 1953. This represents a reduction from the total of 3.1 trillion tons given in publications prior to 1950.

This reduction came about principally through completion of reappraisals in Colorado, Georgia, Indiana, Maryland, Michigan, Montana, New Mexico, North Carolina, North Dakota, South Dakota, Virginia, and Wyoming.

This article is an abstract of a paper presented at the Joint Solid Fuels Conference of the American Mining and Metallurgical Engineers and the American Society of Mechanical Engineers, at Columbus, Ohio, in October 1955. Prior to that, the original version was published by the Missouri School of Mines in its Technical Bulletin Series No. 85.

What We Need to Know About It

Future coal production and use in the U. S. demand new facts and reappraisal of old information on coal reserves. Criteria for more ready evaluation of the extent of previous mining and specific mining possibilities in new fields are needed now.

A further reduction from the pre-existing figures resulted from using estimates compiled by individual state geological surveys rather than those compiled previously by the federal survey in the states of Illinois, Kansas, Missouri, Pennsylvania and West Virginia.

These totals represent coal in place, generally that in beds having a minimum thickness of 14 in. for anthracite and bituminous coal, and 30 in. for subbituminous coal and lignite, all to a depth of 3000 ft. Since 1950, the U. S. Geological Survey has stated estimated recoverable reserves as 50 percent of the total reserves in place, so that the current figure for total recoverable reserves of all ranks in the U. S. becomes 950 billion tons. The last total is but a progress total, with additional statewide reappraisals—to the best of my knowledge—underway in Alabama, Kentucky, and Oklahoma.

• U.S. Bureau of Mines

Since October 1950, the U. S. Bureau of Mines has released "Estimates of Known Recoverable Reserves" for some 23 individual counties in Pennsylvania, Kentucky, West Virginia, Tennessee and Maryland. While restricted to estimates on coking coals, such county studies usually cover all known coal beds in that county.

Estimates of reserves in place are based on a minimum thickness of 14 in., although estimates of recoverable reserves are restricted to minimum bed thicknesses of 28 in. Areas of reserves are restricted to those classified as measured or indicated by defined distances, following U. S. Geological Survey procedure. No estimates of reserves are made from geologic inference alone, however, so that there are no amounts for coal of an inferred classification.

A most important phase of these Bureau studies is the determination of actual percentage of recovery, as represented by the ratio of the total number of tons produced from a given mine or mines to the total tons originally in place in the mined-out area. So far, countywide average percentages of recovery range from 46 to 65 percent.

It is of interest to note that the total reserves in place in nine Penn-

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"There is an imperative need for new information and for reappraisal of old information, especially in states or areas in which much of the previous work was of a reconnaissance nature or was compiled from viewpoints no longer applicable. The state-by-state reappraisals being conducted by the U.S. Geological Survey, recent overhauling of coal bed information by the Kansas, Illinois, and Ohio Geological Surveys, and the countywide Bureau of Mines' studies constitute great forward steps. But additional physical criteria for more ready evaluation of specific mining possibilities are needed.

"A neglected but important aspect, in my opinion, is data on the location and extent of mined-out areas. These areas have been delineated and excluded from further consideration by the Bureau of Mines, the Illinois Geological Survey, and the synthetic liquid fuel survey.

"While mine maps or other records of previous mining no longer exist in many parts of the country, the subject to me seems so important that perhaps new efforts should be made to discover, or contrive new procedures for determining, something as definitive as possible on such areas. Exploitation of remaining coal reserves in areas of substantial previous mining will be directly affected by information or the lack of it on previous extraction.

"Where coal fields have been extensively worked over for long periods of time — such as those in Great Britain and our own anthracite area — opportunities for economically overcoming the difficulties caused by previous depletion and previous mining concepts have about vanished, since there are no places for completely new mines except at great depths. If the coal is badly needed, as in Great Britain, the mining must be pursued, but costs will continue, on the whole, to increase.

"Where virgin reserves are available as in this country, however, the economic limitations imposed by previous mining practices and depletion can be left behind through the opening of new mines, even though the coal beds may be relatively inferior in physical characteristics, quality, or geographic location."

sylvania counties total 15.9 billion tons, compared with 49.6 billion tons estimated for the same counties in the State Geological Survey report adopted by the U. S. Geological Survey. Similarly, the total Bureau of Mines reserves in place in four West Virginia counties are 6.4 billion tons, compared with 13.2 billion tons for the same counties in the State Geological Survey report adopted by the U. S. Geological Survey. However, the Bureau of Mines' estimates do not include inferred reserves.

• State Geological Surveys

In March 1947, the Kansas Geological Survey published the results of a detailed study of coal reserves in that state, based upon all information available from deep-mine occurrence, drill holes, and outcrop studies. Coal beds down to 10 in. thick and 1200 ft deep were considered. Proved reserves were found to be 950 million tons and the potential reserves, 17.5 billion tons, as of January 1, 1946.

The total of these two amounts—modified for production and mining losses up to January 1, 1950, and as used by the U. S. Geological Survey in Circular 94—was 17.6 billion tons, compared with the pre-1948 U. S. Geological Survey figure of 29.6 billion tons. One factor serving to increase this differential was the basis of 1500 tons per acre-foot rather than the 1800 tons per acre-foot now used on a nationwide basis by the U. S. Geological Survey.

In 1953, the Illinois Geological Survey published a complete reappraisal of the "Minable Coal Reserves of Illinois," based on preparation of work maps for each coal bed within 30-odd coal bearing areas, each represented by 1 deg longitude and ½ deg latitude. On the maps was placed all information available from mine studies, records and maps, drill holes—both for coal and for gas and oil—and outcrop observations. Reserves were based on a minimum thickness of 28 in.

There are several distinctive features of this report. Where remaining reserves estimated by U. S. and most other state geological surveys have been reached by first determining the original reserves in a coal bed and then subtracting a figure representing the total coal mined out and lost by mining, the preparation of the Illinois estimate was based on delineation of all mined-out areas on work maps and exclusion of such areas from any further consideration as reserves. This procedure—the same as that followed by the U. S. Bureau of Mines—properly removes from estimates of reserves all lost coal within a given mined-out area, whether avoidable or unavoidable. Thus excluded is such coal as that considered too thin for current mining within otherwise minable areas, that left unmined under towns, railroads, highways, and similar structures, that left to protect gas and oil wells, and that left in barrier pillars between mines and along property lines.

Another distinctive feature is the division of the indicated, or inferred, category into two classes, based on carefully defined "strong" or "weak" character. This delimits into two readily understandable zones—both of amount and adjacency to better known areas—the usually large figure commonly set forth for geologically inferred reserves after estimates of proved-probable or measured-indicated reserves.

Total reserves in place in this latest Illinois report are 137 billion tons, compared with 165 billion tons in U. S. Geological Survey Circular 94 and 197 billion tons in the preceding U. S. Geological Survey estimates. Of the total reserves, 14 percent are proved, 30 percent probable, 44 percent strongly indicated, and 12 percent weakly indicated.

The Ohio Geological Survey is currently engaged in a complete reappraisal of coal reserves similar to the Illinois study. The Ohio survey has published new estimates of reserves for two coal beds, the Meigs Creek No. 9 and the Lower Kittanning No. 5. The State Survey has also cooperated with the U. S. Geological Survey in a very recent reappraisal of reserves of the Pittsburgh No. 8 bed.

• Synthetic Fuel Survey

At the request of the Synthetic Fuels Branch, U. S. Bureau of Mines, the Army Corps of Engineers in 1949 instigated a nationwide survey of raw material resources for the manufacture of synthetic liquid fuels. Raw materials studied include coal, natural gas, oil shale, and oil impregnated strippable deposits.

In this survey, 22 state reports were compiled and over 1000 work maps were prepared, generally of the size of 1 deg longitude, and ½ deg latitude. No field investigations were conducted in compiling these state reports, as the contract for the survey called for estimates based on "available" information.

Total recoverable reserves estimated in this survey approximated 169 billion tons, or about 325 billion tons in place, of which 48 percent were primary in classification, and 52 percent secondary. In this survey, the estimate of recoverable reserves in nine Pennsylvania counties was double the estimate by the U. S. Bureau of Mines.

• here's how reserves are distributed

The several ranks of coal—lignite, subbituminous, bituminous, and anthracite—distributed in the four geographic regions are measured as to amounts and rank, calorific value, thickness, and depth.

• By Amounts and Rank

Data here is from the 1950 U. S. Geological Survey of total recoverable reserves, modified by later reappraisals in North and South Dakota, Virginia, and Illinois.

Most of the lignite is in the Far Western area, in North and South Dakota and Montana. The lignite in the Western Interior area is mainly in Texas and Arkansas.

All the subbituminous coal is confined to the Far Western area, mainly within the huge intermontane basins in the Rocky Mountain province and on the High Plains immediately to the east.

The bituminous coal reserves comprise 55 percent of total reserves and are distributed widely within each geographic area. Thirty-six percent of total bituminous reserves occur in the Appalachian area, 20 percent in the Eastern Interior area, 16 percent in the Western Interior area, and 28 percent in the Far Western area.

Anthracite is largely confined to Pennsylvania, with very minor amounts in Virginia, Arkansas, and Colorado, and token amounts in New Mexico and Washington. Approximately 32 percent of the total coal reserves lie east of the Mississippi River, and consist entirely of bituminous coal, with some anthracite. The 68 percent of total reserves which occur west of the Mississippi include all of our lignite and subbituminous coal resources.

• By Calorific Value

Heat value—rather than weight in tons—is also important in considering the distribution and eventual utilization of reserves. One ton of lignite, for example, represents the thermal equivalent of about ½ ton of high grade bituminous coal. In calorific value, lignite reserves represent 13.4 percent of the total heat energy in all coal reserves, subbituminous coal 19.1 percent, anthracite 0.7 percent, and bituminous coal 66.8 percent.

• By Thickness

The distribution of coal reserves according to thickness involves numerous definitions and delimitations as used by the various agencies in making up their estimates. For this discussion, the tentative conclusions of the U. S. Geological Survey are used.

In this survey, thick coal—over 3 ft 6 in. for bituminous coal and anthracite, and over 10 ft for subbituminous coal and lignite—represents about 30 percent of estimated total reserves. Reserves in beds of intermediate thickness represent 25 percent of total reserves, while those in thin beds—less than 28 in. for bituminous coal and anthracite, and less than 5 ft for subbituminous coal and lignite—approximate 45 percent.

• By Depth

Maximum depths of 2000 or 3000 ft — to which some estimates of coal reserves are compiled — are sure to suggest serious difficulties to the mining engineer who is well aware of difficulties of roof control in well-known areas of heavy thickness of cover. Actually, however, the very lack of information at such maximum depths precludes the finding of very significant amounts of reserves in such categories.

The recent statewide reappraisals conducted by the U. S. Geological Survey indicate that, in general, 85 percent of their total estimated reserves will be found at depths of less than 1000 ft, with 10 percent in the 1000 to 2000 ft category, and about 5 percent at depths over 2000 ft.

Need Mine Engineering Data

In my opinion, the largely geologic treatments of reserves so far developed are insufficient for considerations of a more applied nature which are becoming increasingly necessary in view of obvious differences in conception of overall coal reserve totals and hard coal-producing facts. There is no question that the current reappraisals by the U.S. Geological Survey and such new estimates as those of the Bureau of Mines and the Kansas, Illinois, and Ohio Geological Surveys, are leading to a much better conception of coal reserve characteristics, such as thickness, depth, and general quality than ever before.

At the same time, however, there are conspicuous handicaps confronting present and future coal-mine engineering in lack of information on several aspects. These include reserves by individual coal beds, occurrence and position of adjacent water-bearing strata, occurrence of faults or wants, type of roof and floor, etc., and cost of mining for each individual bed. ✠

In the next article on this subject, the author will summarize present mining conditions and coal reserves in the four major areas of the U. S.

Spot Cool Cars and Planes in Southwest

. . . use 3 ton waterless air conditioners in service stations, hangars

If you ever pull into a southwest plains gas station after a long hot drive, you might see the attendant pick up a wide flexible hose and literally throw the end of it right into your car. You needn't be alarmed, for what comes out of the hose is just plenty of cool, dry air — a new wrinkle in retail gasoline merchandising.

These waterless, portable 3 ton capacity air conditioners for gasoline dealers and aircraft manufacturers in the west and southwest are becoming quite popular, according to the Airtemp Div. of the Chrysler Corp.

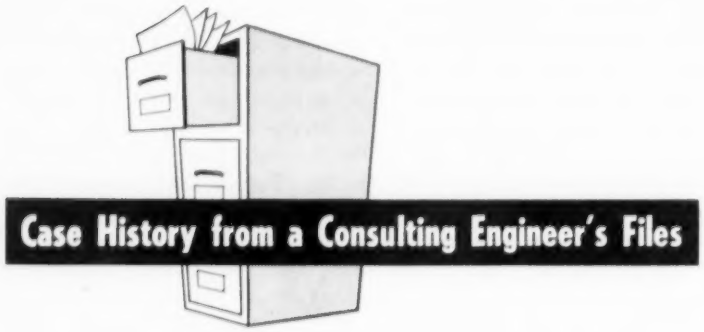
Gasoline stations use them to provide autos with a quick cooldown while they are being serviced. No accurate measurements are available yet to determine the value of this approach. However, all reports indicate that motorists highly value this humane gesture, and show appreciation by returning later.

This type of air conditioning — "spot cooling" — is put to a greater variety of uses every day. Airplane manufacturers use the small units to throw cool air upon crews of mechanics working on sizzling airplane engines and fuselages in temperatures of 110 F and higher. ✠

What's Wrong with Modern

Modern piping systems, for efficient and satisfactory operation, must be correctly designed, and then they must be operated as designed. Efficiency and satisfactory operation is lost, says the author, when unqualified operators or "bootleg" advisors, "in the confidence of ignorance," proceed to change an installation. Here are representative cases from the author's experience showing the frequent need for shakedown inspections. In all of these cases, complaints stemmed from originally incorrect design or subsequent improvisation.

By C. T. Baker
Consulting Engineer



Case No. 1

A LARGE PRODUCER of brick and sewer pipe experienced difficulty in properly drying and curing the pipe following its removal from the press. Steam coils for the dry rooms and storage rooms for the pipe were arranged as shown in Fig. 1. Paving brick were processed in another structure.

Several years after the business was established, a decision was reached to concentrate largely on the production of tile. Accordingly, most of the plant facilities were devoted to turning out tile piping of various sizes. The tile is dried in the dry rooms on the first floor, then stored on the second floor until shipped.

During periods of maximum demand for the product, it was necessary to complete the drying process of much of the product on the second floor. Exhaust steam at 10 to 12 psig from a large Corliss engine was used to supply heat to the dry rooms and storage rooms. During weekends and holidays, live steam at 125 psig was used, since there was no exhaust steam available at such times. The steam coils were near the ceiling in all rooms where tile was handled. With the exception of one room on the first floor, all heating coils were made of 1½ in. pipe. The walls were wood, not insulated.

During a span of 16 years from my previous survey of this development until my last inspection, several changes had taken place. One of these was in the method of draining the condensate from the coils of the several rooms.

The new plan was very simple. A common condensate header connected the condensate outlet of the coils of all rooms on both the first and second floors. This replaced the traps originally used, one on each coil. A pipe loop was connected to the condensate discharge end of each header as shown in Fig. 1. Of course, steam at 10 to 12 psig, acting on these coils, blew a continuous stream of steam and condensate through the pipe loop.

The plant operators wanted 200 F in the rooms. About the best that could be done after the original traps were removed was 125 to 130 F. The waste of live steam when used was terrible, since a lot of steam at 125 psig flows through such a coil hookup, even though a hand operated stop valve was installed as a means of regulating the flow of steam through the loop.

The problem of raising the ambient temperature from 125 F to 200 F was solved by installing a modern steam trap on each coil and the elimination of the loops. A hand blowout valve was placed on the condensate line near the inlet to the traps to permit the coils to be drained when and if necessary.

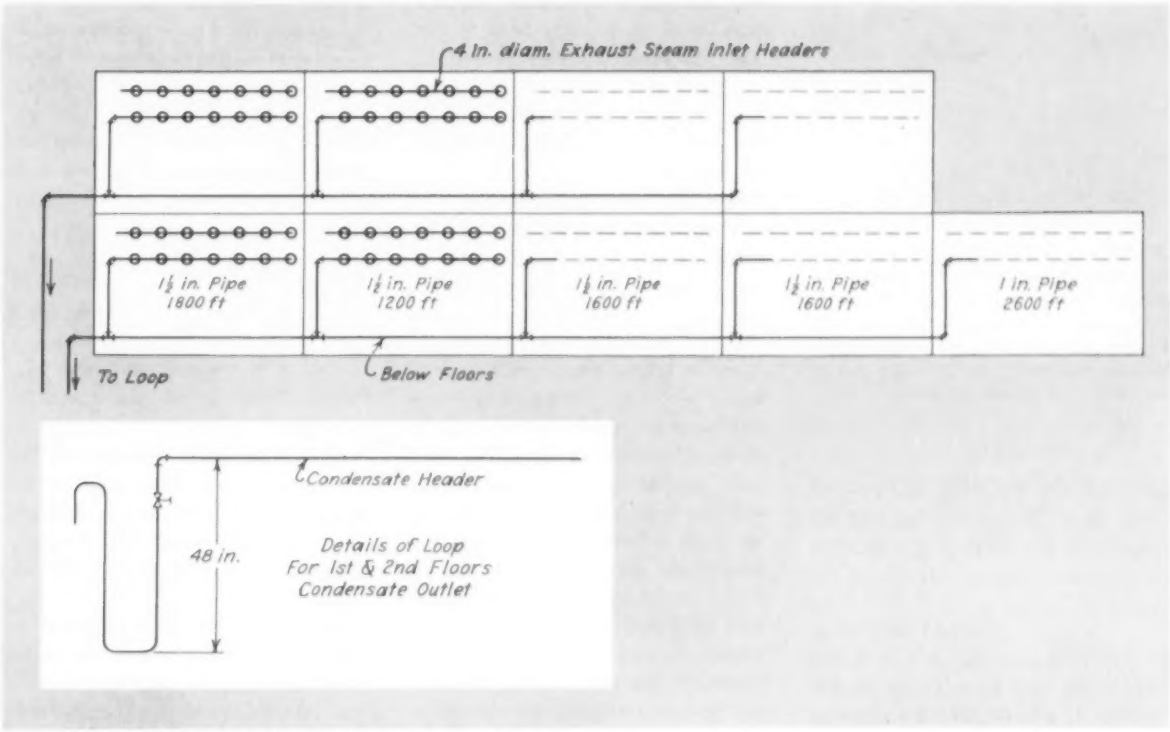
It was upon the "bootleg" advice from an unqualified source that the original traps were thrown out and the loops installed.

Case No. 2

TWENTY years ago I made a complete survey of the boiler plant, steam distribution system, and refrigerating plant of an institution of learning. A boiler test showed a very low rate of water evaporation per pound of coal as fired. Some automatic controls that were not being used were put back in service. After putting the plant in order, the overall boiler and furnace efficiency was raised. At that time, coal cost $5.12 per ton delivered. Today the same coal costs $9.11 delivered.

Recently I was called back to make another complete check on this plant's performance. Automatic feedwater regulators had been shut off, and the feedwater bypassed around

Steam and Refrigerant Piping?


4 In. diam. Exhaust Steam Inlet Headers
1½ in. Pipe 1800 ft
1½ in. Pipe 1200 ft
1½ in. Pipe 1600 ft
1½ in. Pipe 1600 ft
1 in. Pipe 2600 ft
To Loop
Below Floors
Condensate Header
2"
48 in.
Details of Loop For 1st & 2nd Floors Condensate Outlet

1 DRYING KILN for brick and sewer pipe required steam at 200 F in drying and curing rooms. However, when inexperienced persons removed individual condensate traps originally installed on each coil and installed common condensate headers to drain the coils of all the rooms on both floors, steam at 10 to 12 psig blew a steady stream out through the loops at the ends of the headers

them. Boilerfeed pump regulators had been disconnected and were not being used. Damper regulators were disconnected. Also shut off was the valve for the purpose of supplying any deficiency in exhaust steam required to bring the temperature of the water in the deaerating feedwater heater to the proper value for satisfactory deaerating. Feedwater temperatures varied from 150 to 185 F.

This equipment had been put back to work 20 years ago and had operated satisfactorily for several years. When the chief engineer was asked why this valuable equipment was not being used, he said, "It might work other places, but it's no good here."

Both of the tandem assembly 2 in. blowoff valves on one of the three 185 hp water tube boilers were leaking badly. The boiler pressure was 105 psig. Explaining this serious loss in heat, he said, "I haven't had time."

The soot blowers on two of the boilers were out of commission because there were no repair parts on hand for reconditioning.

The 20,000 lb per hr feedwater heater was supposed to operate at 2 psig. A pipe loop about 8 ft overall in length had been installed originally to the overflow connection. It was arranged to deliver any overflow to the floor back of the heater.

Later, someone who did not like this standard arrangement, connected the free end of the loop to the hot condensate line that returned the condensate from the heating system of several buildings, a laundry, and a kitchen, to the receiving tank in the boiler room, from where it was pumped to a large tank above the heater.

In view of these findings, perhaps piping systems should be audited by an outside engineer every year.

Case No. 3

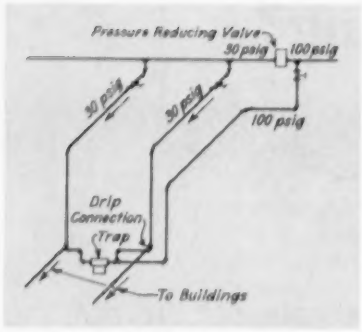
STEAM supplied to a group of buildings at a pressure of 30 psig was reduced from 100 psig. At each building, the pressure was reduced from 30 psig to about 5 psig for space heating.

A trap on the floor of the entrance to the pipe tunnel was intended to remove condensate from the low point of the two 6 in. steam supply mains.

A condensate drain connection on the upstream end of the reducing valve was connected to the same trap that was supposed to drain the two 30 psig lines. This arrangement is shown in Fig. 2 on the next page.

Attempts to save buying a separate trap for the high pressure line, plus the manner of connecting the high pressure drain to the low pressure service, rendered the trap useless.

In addition, the hookup was such



2 STEAM DISTRIBUTION system for an institutional plant had several faults. Among them, a trap on the floor of the pipe tunnel to remove condensate from the two 30 psig mains was made useless by a connection to the upstream end of the 30 to 5 psig reducing valves

as to permit steam at 100 psig to enter the 6 in. supply lines and act directly on the 30 psig to 5 psig reducing valves at the entrance of the several buildings.

A laundry was a part of the institutional installation. It was moved lock, stock, and barrel from its former location and put in service at the new location.

Here again was evidence of false economy. One steam trap was made to drain the condensate from a multi-roll ironer. As a result, these rolls cannot and do not heat as they should.

There were several steam presses installed. Here again false economy was practiced. One trap was made to drain two presses, and here again equipment operation was sluggish.

Conditions such as these cause unnecessarily high costs of operating steam plants, industrial boiler plants, etc.

Case No. 4

AN ABATTOIR processed 440 hogs per day, 5 days per week. The average weight of the animals when dressed and ready for the chill room was 140 lb. To cool this number of hogs from 100 F to 35 F, plus heat leakage losses into the chill room, required 13 tons of refrigeration.

The normal daily operation required that the killing be completed and the hogs dressed and placed in the chill room by midafternoon. This, of course, placed a heavy load on the refrigerating plant for several hours and in addition, caused a rise in room air temperature, requiring several hours of cooling before temperatures could be brought back to normal. This created a very undesirable condition and brought complaints from the management, who insisted that something be done to eliminate the trouble.

So a new chill room was built. Two new units were installed to handle the cooling load. To prevent a sudden rise in temperature during the killing and storing period, it was decided to drop the temperature to 20 F in advance of killing time, which usually began at 8 a.m., by which time the chill room had been emptied and was ready to receive the next lot.

To provide for the operation of the new room at two different temperatures, the following scheme was followed.

The liquid ammonia supply line to each of the two coolers was equipped a solenoid valve. These valves were controlled by two thermostats, one for the low temperature operation, 20 to 24 F, and the other, 36 to 38 F. When the low temperature period was over, the low temperature thermostat was switched off and the high temperature thermostat was switched on. This manual operation could have been made automatic, but the cost of automatic control installed was approximately $350, which was considered unwarranted.

In order to provide the two different operating temperatures in the chill room as described, it was necessary to provide means for an evaporating pressure and temperature suitable to each. This was accomplished by the use of a dual evaporator control.

The operation of the new chill room was satisfactory, following the final adjustment of the various controls. No trouble was experienced from dehydration of the product during the period of low temperature operation. Since the refrigerating capacity of the two cooling units selected was ample for both the high and low temperature conditions, no difficulty was experienced in holding the temperature at the desired points. The controlled period of low temperature operation prevented temperature runaway conditions during the room loading time.

After a few days' operation of the new facilities, it was easy to set up an operating schedule for the plant operators on each shift which would enable them to make the changeover from high temperature to low temperature operations at the correct time.

Case No. 5

FIVE refrigerating machines supply a number of walk-in refrigerators, including one low temperature refrigerated cabinet, at an educational institution.

A separate liquid line connects the individual refrigerating units to one or more refrigerated rooms. A liquid dryer is placed on each liquid supply line to remove moisture from the refrigerant.

No bypass has been provided to permit these dryers from being taken out of service for re-charging with new drying material. These units have, for the most part, been in service about eight years. They are still being served with the original drying material.

The liquid lines are "securely" held in place by nails driven into the wooden partition and bent over. The ends of the shell and tube condensers are so located with reference to the walls of the building that it is impossible to scrape the tubes to remove deposits from the condensing water. If a tube should develop a leak, the condenser would need to be removed from below the compressor and moved to some point where there would be room to remove the defective tubes and install new ones.

Because the room in which the compressors are located is not properly ventilated, the motors driving the compressors operate at abnormally high temperatures. Condensing pressures are high, possibly due to dirty condensers and air in the system. Power costs are also high. Room air temperatures are not satisfactory during the hottest weather. The cause of this deplorable situation? The lowest bidder. ⧺

Sam Lewis' Page

Ventilation Revives Wilted Workers

. . . in laundries and pressing plants. Employee efficiency and output increased when filtered outdoor air at controlled temperature was introduced directly toward faces of workers. Plant efficiency was also increased as a result of improved steam piping layout, hot water temperature control, and fuel handling and combustion.

"No tickee, no washee," said the smiling but firm laundryman as I searched my pockets for the elusive laundry stub. Fortunately, it was found and I was able to get my shirts. As always, they were beautifully laundered and pressed.

My visits to the laundry had made me aware of the conditions of heat and humidity under which the work was done. Since those days my observations and experiences with similar conditions, in big laundries and small, have continued.

In a prominent case, it was up to me to study and to improve the condition of the water used to feed the boilers, and to make the boilers deliver more steam per unit of fuel. I was astonished and pleased to see the appliances for returning to the new, clean, cold wash water, a large percentage of the heat that otherwise would have gone with the dirt to the sewer. I helped to devise means for heating and softening more rapidly and effectively the new wash water. I participated in controlling accurately the water temperature.

I commenced at the fuel burning end and provided mechanical delivery of coal clear into the combustion chambers of the boilers, after making these combustion chambers of adequate size. In another case, I arranged for outside underground storage of heavy fuel oil and for having the oil hot and ready to burn when pumped into the combustion chambers. I straightened out the steam and return piping, tearing out many old former extensions which were no longer used, applying adequate insulation and individual condensate traps with necessary air vents. It is a foible of many operators of growing and improving businesses not to remove each obsolete pipe and valve when some other pipe and valve takes its place.

Also, I installed an efficient electric generator with an engine to make a large part of the electric power, since the basic heat remained in the steam after its pressure was reduced in going through the engine and could be used to heat the wash water. I made sure that the engineer tested, and kept in perfect repair, all of the condensate traps, and that every heat transmitter and fabric press had a separate trap.

I found that the shirt circle girls received practically no breath of uncontaminated air from outdoors. I fixed this by a downcoming duct from an overhead fan that employed new filtered air from outdoors and that supplied a gentle current of controlled temperature — relatively cool — air toward the faces of each girl. Of course I arranged for definite and immediate removal, via hoods, of the heated air from the dryers and for replacement of this removed hot air with new air from outdoors. However, I spent no fuel-dollars to warm the new replacement air, but merely diluted the new air by partial admixture with the too-warm, otherwise uncontaminated air near the ceiling.

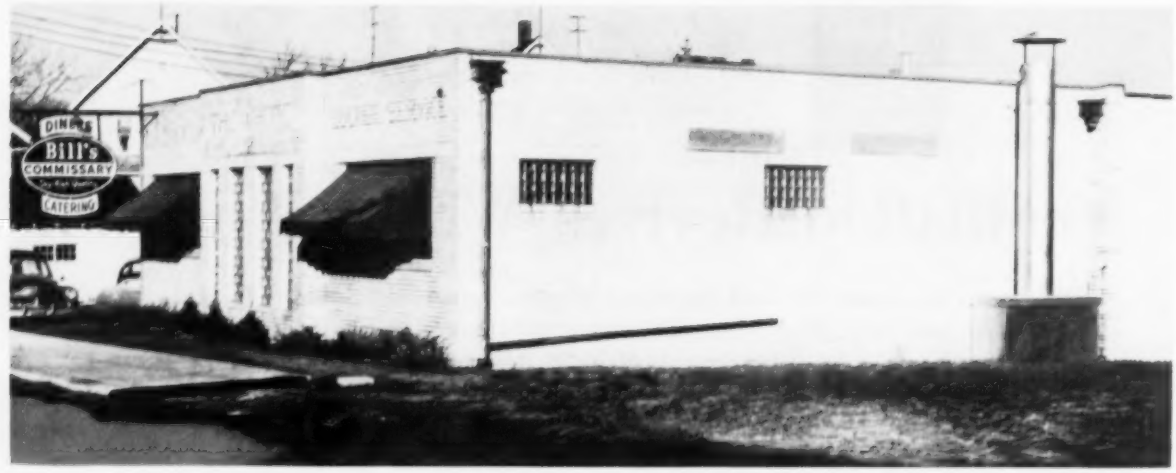
No one in a laundry works more strenuously than do the women who feed and fold and serve the flatwork ironers. I gave them a breeze of delightful alleviation, by means of controlled air-supply nozzles, brought down from the lofty ceiling to levels near their faces.

Long ago, I was called upon to cool the men who press men's clothes in Chicago "sweat shops." These men perform strenuous physical labor, hours on end, close to the steam-hot presses. Engineers had tried to cool the entire room or zone. Fans in walls or windows, forcing air in large volumes along the sides and against the backs of the press-operators, did little good and seemed usually to be harmful.

I provided fans and ducts and automatic temperature control of the air delivered, but I delivered this air directly toward the face and chest of the presser. Indeed, since he could control its direction and velocity, he looked happier and was happier, and he pressed more clothes in a better way than ever he had before.

I simply applied the man-cooling lessons from other industries, such as heat-treating steel plate at Gary, to girl-cooling in laundries and to man-cooling in pants pressing. ✣

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.



INDUCED DRAFT UNIT, at ground level, right, serves the largest commissary between New York and Chicago. A 22 in. diam draft inducer is installed vertically in an aluminized steel housing. Three 14 in. diam vertical smoke outlets enter a 22 in. high by 24 in. wide manifold, mounted above the boiler. This aluminized steel manifold extends through the basement wall into a throated elbow which is connected to the suction end of the fan by a 22 in. diam collar

Induced Draft Vents Boiler at Roof

. . . for large food commissary in Midwest. Induced draft unit counteracts negative pressure in the building caused under some conditions by the exhaust fans over the ovens and ranges.

DESIGNING the new heating and steam service system for Bill's Commissary, North Canton, Ohio, posed a problem, according to the Quick-draft Co. The building's 15 ft high chimney was completely inadequate for venting the oversize 2¼ million Btu per hr gas fired steam boiler that was to be installed. The 4300 sq ft single-story building, with full basement, is in a residential area.

A 65 ft chimney with an inside area of 24 × 24 in. would have been required for firing the new boiler at full capacity. Estimates for building a brick stack ranged from $3600 to $4500. Village codes made it impossible to consider building a steel stack of this height in a residential area. Further, because it would have been necessary to build the chimney against an outside wall adjacent to a property line, it was impossible to guy a steel stack properly. Also, no one could guarantee that a 65 ft stack would overcome the building's negative pressure caused by the exhaust fans under some conditions over the ovens and ranges. The owner also objected to the appearance of a tall stack.

Size Boiler for Expansion

The building's normal heat loss, without allowance for exhaust ventilating fans, was calculated to be 212,680 Btu per hr. To meet conditions imposed by the commissary's requirements and the owner's plans for future expansion, a 2¼ million Btu per hr gas fired steam boiler was recommended for heating only.

Steam is circulated through a suspended fan-coil unit for heating the large kitchen and basement areas. A floor mounted cabinet type of fan-coil unit heats the office, and a suspended projection heater is used to heat the inside truck loading dock.

To maintain the commissary's food preparation requirements, air must be kept fresh at all times and at a constant temperature of 70 F. Outdoor air is used at all times because the air cannot be recirculated.

All the air in the building is changed six times per hour. Therefore, it is necessary to supply sufficient quantities of steam for heating subzero outdoor air to provide tempered make-up air for the building. The boiler also had to be large enough to heat a second floor future addition to the building. Cooling coils for summer air conditioning will be installed in the bay housing the heat changer.

The boiler draft problem was aggravated by the potential danger threatened by the negative pressure within the building. Should one or more of the fans in the fan-coil unit fail while the boiler was firing, the byproducts of combustion would be circulated throughout the commis-

sary. The problem was solved by venting the boiler at roof level by using a carefully controlled induced draft fan that would not obstruct the smoke line with fan or motor.

Draws Smoke from Manifold

The 22 in. diam fan is installed vertically in an aluminized steel housing just above ground level outside the building. Three 14 in. diam vertical smoke outlets enter a 22 in. high by 24 in. wide manifold, mounted above the boiler. This aluminized steel manifold extends through the basement wall into a throated elbow which is connected to the "suction" end of fan by a 22 in. diam collar.

From the top of the encased induced fan draft, 12 ft of 22 in. diam aluminized steel stack is used to exhaust products of combustion at the roof level. A round chinese rain cap is mounted about 18 in. above the vent stack to prevent interference with the draft. Including the sheet metal work, the cost of installing the power draft unit amounted to 72 percent less than the lowest price quoted for building a brick chimney.

Louvers Admit Air to Fan

The induced draft blower is supplied with outside air through louvers concealed under the overhanging top of the steel housing. Standard draft diverters are built into each of the boiler's three smoke outlets.

HOOD AND DUCT SYSTEM above ovens and ranges exhausts all the air in the building to provide a complete air change six times per hour, since the air cannot be recirculated. Boiler not only supplies sufficient steam to temper subzero outdoor air for makeup but has reserve capacity to heat future addition to building

Every precaution has been taken to protect the commissary from the potential hazards of this unusual installation. When the aquastat calls for heat it starts the induced draft blower. A pressure switch in the draft unit, activated by draft alone, starts the fire. When the call for heat is satisfied, the aquastat turns off the fire, and through a delayed action relay keeps the draft fan operating long enough to purge the boiler. There can be no fire in the boiler until after full draft is established. Firing experience, during near zero temperatures, has proved that there is no more basement air lost through the draft diverters than is beneficial as additional ventilation.

Ceiling Is Air Plenum

Another unusual feature of this installation is the use of the ceiling as a plenum for the distribution of warm air over the large kitchen and food preparation area. Through louvers in the subceiling, warm air is distributed during the heating season and cooled air in summer.

The heating contractor was Bill Peters Plumbing and Heating Co. ✣

Largest Air Conditioning Conversion Job Underway

. . . in Chicago's 45-story Field building

THE LARGEST single air conditioning conversion job in the U. S. so far is underway in one of Chicago's largest buildings, according to R. M. Palmer, manager of the Field building. A $5 million program to make air conditioning available to all 357 tenants will involve the fifth through the 44th floors, or 800,000 sq ft. The lower floors, with over 200,000 sq ft, were conditioned when the building was built in 1934. The original system will be connected to the new installation.

Four rooftop penthouses will be built at the 24th floor setback and another at the 25th floor setback to house fans and other machinery. A four cell cooling tower will be erected on top the 25th story penthouse.

Compressors for the 1000 ton, dual duct, high velocity system will be installed in the subbasement.

The job is scheduled for completion by summer, 1957. The architect and engineer for the project is Naess & Murphy. ✣

On the Job
—notes from the field

Steel Pipe Grids Serve Two New Ice Rinks

. . . permit skating even in mild weather

ICE SKATING RINKS are increasingly being depended on by recreation leaders and skating enthusiasts to provide skating throughout the fall and winter, since winters are becoming milder in many parts of the U. S. Two new outdoor rinks recently installed in Michigan and New York total over 16 miles of steel piping, according to the Spang Chalfant Div. of The National Supply Co.

Nine and one-half miles of 1 in. pipe carry chilled brine to every part of the 85 by 185 ft rink in Veterans Memorial park, Hamtramck, Mich. The system automatically maintains hard ice for hockey, damp ice for figure skating, wet ice for racing, and ice halfway between hard and damp for pleasure skating, simply by a change of the setting on a thermostat.

The pipe is supported by steel "sleepers" directly over the ground, with sand fill to make a level grade. Sand is used around the pipe and over it for cushioning and insulating purposes and to absorb water when the ice is allowed to melt. Circulation of the brine causes the sand to freeze, which in turn freezes water sprayed above it.

This rink was designed and constructed by Charles R. Beltz and Co.

Two 100 hp compressors, using a fluorinated hydrocarbon refrigerant, are in a 24 by 24 ft room at the edge of the rink. Mounted on each compressor is a water cooled condenser, a brine cooler, heat exchanger, expansion valves, and thermostats.

The refrigerant-to-brine principle, first applied to a skating rink by Charles R. Beltz and Co. in 1947, permits the ice temperature to be varied from 25 to 32 F as desired. In general, the brine is chilled to 15 F and is circulated through the pipes at a rate above 1600 gpm. The brine reaches a temperature of about 17 F by the time it returns.

Sodium bichromate and caustic soda are used in the brine to keep it in an alkaline condition, maintaining a pH of about 8 to 10. This inhibits corrosion, which could be caused by a highly acidic brine solution.

A seven man crew installed the piping in only three weeks working time. Four men were used for gas welding the 40 ft lengths of pipe, two men for placing the welded sections into place, and one man for arc welding the pipe to the headers.

Once the sections of the steel pipe were joined, they were placed on the steel sleepers, which maintain the pipes on 4 in. centers. The sleepers are on 10 in. centers.

When the pipe installation was complete, it was tested hydrostatically under a pressure of 125 psi. The pipe itself is made to withstand pressures up to 800 psi but the test was limited to the rated capacity of the fittings.

At the foot of Low-Tor mountain, 20 miles north of New York City, more than 7 miles of steel pipe are installed in a new 85 by 150 ft rink.

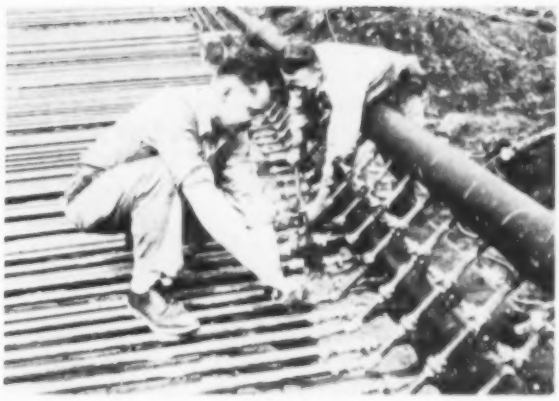
Install 4 Miles of Underground Piping to Heat New

HEATING LINES of 14 in., ⅜ in. wall seamless pipe installed at the new U. S. Air Force strategic air base at Plattsburg, N. Y., are being readied for insulation. They will be embedded in concrete mixed with exploded mica

NEARLY 4 MILES of 14 in., ⅜ in. seamless pipe is being installed in underground trenches to carry heat at the U. S. Air Force strategic air base at Plattsburg, N. Y., under construction, according to the Jones & Laughlin Steel Corp. Operations offices, ready-rooms, barracks, the base hospital, and all other buildings will be heated. Inside temperature, regardless of weather, will be 70 F.

Delivered in 40 ft lengths, the pipe was laid in a double row, for hot water supply and return, on a 4 in. layer of concrete in a series of

ARC WELDING was used to attach steel pipe to headers at Veterans Memorial park, Hamtramck, Mich. Gas welding was used to weld the lengths of pipe to each other. A seven man crew completed the installation in three weeks' working time



FINAL CONNECTIONS at the Low-Tor ice rink, West Haverstraw, N. Y., were being made when this photo was taken. Header, right, carries refrigerated brine from compressors to the 1 in. steel pipes that form the grid. Note shutoff valves

Built for William F. Larkin, owner of the Garnerville Ice Co., the rink adjoins the ice plant and utilizes the same compressors. Mr. Larkin also supplies the artificial snow used for the ski jumping meets at Bear mountain.

Pipe for the grid is 1 in. in diameter, with larger sizes for headers and other lines. The headers, at the side of the rink, step down from 10 in. pipe to 4 in. pipe. The brine return is a 10 in. line, laid at the bottom of the system along the same side of the rink. The whole feed and return system is covered with wooden boxing, which also serves as a guard rail.

Twelve in. pipe is used from the compressors to the headers, and 10 in. pipe from the pumps to the compressors. A system of shutoff valves leading from the header pipes makes it possible to regulate the ice temperature throughout the rink.

Refrigerating equipment includes three ice compressors, generating approximately 100 hp and capable of producing 35 tons of ice a day. Two 450 gpm pumps circulate the refrigerated brine at the rate of 900 gpm through the ice rink piping at a pressure of 30 psi. The system has been tested at pressures greater than 125 psi.

The rink was built by leveling off the ground and then laying 9 in. of gravel, topped by a layer of fine sand. On top of the sand are 2 by 4 in. "sleepers" with tee irons on 7 ft centers. The 1 in. pipes are laid 3½ in. apart. Each line forms a long loop that extends from the header to the opposite side of the rink, makes a U-turn, and continues to the return line.

The pipe is covered with a layer of sand, over which water is sprayed. Circulation of refrigerated brine through the grid causes the water to freeze, forming a firm surface of ice. The brine is treated with sodium bichromate as a corrosion inhibitor.

The rink was designed by B. E. McFarland and built by the Jersey Ice Machine Co. ⫩

Air Force Base

trenches. The "uphill" welding method is being used, averaging 2½ hr per weld, and four "passes." The pipe is periodically tested with air pressure. About every 300 ft along the line, are expansion loops, 30 to 40 ft U's, laid on the same plane as the rest of the line. The pipe is being insulated with a mixture of concrete and exploded mica.

Water will leave the boiler at 380 F and return at 220 F.

The heating lines are being installed by the firm of Coffey and Teachout. ⫩

More Central Cooling Plants Going on Roof

CENTRAL COOLING PLANTS for large air conditioning systems are going "up in the air" in increasing numbers, according to the Carrier Corp. The reasons are a new hermetic centrifugal unit and a new series of absorption cooling machines. Both water chilling devices are light in weight, quiet, and practically vibrationless and can readily be installed on upper floors or rooftops. Both are also designed to reduce installation cost and to provide simple completely automatic operation under electronic control.

The centrifugal is powered by an electric motor and uses finely balanced impeller wheels spinning inside a closed chamber to operate its cooling cycle. The absorption machine has no major moving parts at all and runs on heat energy, usually from steam.

How do you choose between the two and decide where to put them? While the actual selection of type and location must be based on a complete economic analysis, there are some rough rules of thumb. Probably the first thing to do is to check the com-

parative cost of different sources of energy such as electric power, fuel, and steam. If electricity is relatively lower in cost, then operating expense economics might very well favor the selection of the new hermetic centrifugal machine. However, if the cost of steam or fuel to produce steam is comparatively lower, then the best choice could be an absorption unit.

But there are some complicating factors. Suppose for example the installation is to be made in an existing building where electric energy rates might seem to favor a centrifugal. Yet heavy transformers required for the electric drive are not available. The cost of installing them might make an absorption machine the first choice even though it would cost more to operate.

Or take the opposite case where electric switch gear is installed, and there is no boiler or other heat facilities available. A thorough analysis might show that a centrifugal is the better investment from the standpoint of overall owning and operating expense even though steam is relatively lower in cost.

Another possibility where low cost, high pressure steam is available is to obtain a centrifugal refrigerating machine driven by a steam turbine. Back pressure steam from the turbine can be used to operate an absorption refrigerating machine tied into the same chilled water system, thus providing double use from the same steam supply and quantity.

As to location, a refrigerating machine usually requires a cooling tower to save water used in condensing. If the machine is located in the basement such piping must be run up through the building to the tower on the roof, and this may not only take up space but affect installation cost.

Or if an absorption machine and boiler are to be obtained, placing the equipment in the basement means additional space in the building consumed for a boiler stack extending to the roof. A rooftop installation of a refrigerating unit next to the cooling tower may be just what the doctor ordered, shortening condenser water piping, requiring less space in the building, and leaving the basement free for other facilities.

In very tall buildings it may be desirable to handle the lower part of the building from a central plant in the basement and the upper floors from one on the roof. This shortens the distance chilled water for air conditioning must be piped up through the structure and reduces the cost of pumping facilities. So a "split" system incorporating either centrifugal or absorption machines on the roof and in the basement might be the best.

Each building presents a different case which must be subjected to a careful engineering and economic study in order to determine the perfect choice.

The highest installation to date is an absorption refrigerating system on the 56th floor of the Chanin building in New York City. ⫩

Package Units Condition Diamond Ring Plant

. . . installation of four 15 ton water cooled units improves employee performance, maintains uniform production

RING MAKING PLANT found year 'round air conditioning necessary for precision work and stable productivity

THE INSTALLATION of 60 tons of water cooled package air conditioning equipment was part of the recent modernization of the B. F. Hirsch, Inc., ring manufacturing plant in New York, according to the Airtemp Div. of the Chrysler Corp.

Two 15 ton units are installed in the ring making and diamond setting areas. Another 15 ton unit handles the cooling requirements of general offices, private offices, and storage vaults. A fourth conditioner of the same capacity is installed in the firm's employee cafeteria.

Highly exacting precision work requiring the utmost concentration necessitates the best possible working environment. Air conditioning was installed after an analysis disclosed that production declined and many hours were lost due to employee fatigue during high temperature.

Employee performance has improved, and production no longer fluctuates with the temperature. The staff of more than 100, in addition to enjoying the comfort of air conditioning, also find that the removal of excess moisture and dust from the air aids considerably in precision work.

Packaged air conditioners were chosen because of their adaptability to the plant's particular requirements. They held ductwork to a minimum and offered economical operation because certain production areas must have cooling available throughout the year.

The air conditioning engineer and contractor was Admarell Air Conditioning Co. ⫩

How to Design Good Fan Inlet Connections

By C. Jack Trickler

Chief Engineer
The New York Blower Co.

THE LARGEST single factor causing poor fan performance — low air delivery — is improperly designed inlet connections. Of the letters received by fan manufacturers reporting failure of a fan to deliver its rating, nearly all cases can be corrected by changing the ductwork immediately preceding the fan inlet.

When air is turned in an elbow, its momentum forces it to follow the largest radius.

If the elbow is placed away from the fan, all this means is a higher resistance loss through the elbow than through an equal length of straight duct. However, when the same elbow is placed on a fan inlet, it becomes a part of the fan. By throwing the air to one side, it makes the fan do all its work through a portion of the wheel and housing. The result is a loss of air delivery combined with a loss in efficiency and often an increase in horsepower. A poorly designed inlet connection will often reduce a fan's capacity by 30 percent without appreciably changing the horsepower.

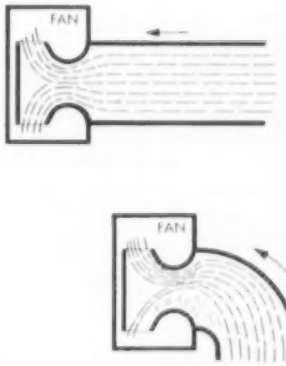
The best inlet connection is a straight duct long enough to assure smooth flow into the fan inlet, as shown in Fig. 1a. This is often awkward, however, and some form of elbow or inlet box must be used. See Fig. 1b. Common types of inlet connections and their probable effects on a fan's performance are shown in Fig. 3.

The worst type of inlet connection — the inlet box shown in Figs. 2a, 2b, and 3a — is, unfortunately, almost impossible to tabulate because of its many variations. The air is not allowed to flow smoothly into the fan. Its momentum causes it to flow past the inlet into the protruding corners of the rectangular duct. The turbulence set up adds to the elbow effect to create a loss in capacity, which may run as high as 50 percent.

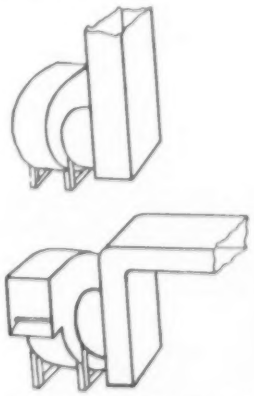
Fortunately for those faced with design or correction problems, this subject is not a lost cause. The best type of inlet connection is a straight duct of at least five diameters — preferably 10 — in length, but space limitations often allow only abrupt turns. New installations can be designed around the better elbows and compensation made in speed and horsepower requirements.

Where the best possible performance or maximum efficiency is demanded or an existing installation is to be corrected, the use of turning vanes or guide vanes is usually wise. The table for square duct elbows indicates what effects well-designed vanes can have on a fan's performance. The fan shown in Fig. 5 without vanes would have a capacity loss of about 16 percent while with vanes it would be 3 percent. Three or four vanes are usually best. Fewer than that do not do the job, while more cause interference.

Turning vanes are especially useful for those connections in Figs. 4a and 4b. The largest turning vane should close off the rectangular duct and the other vanes should distribute



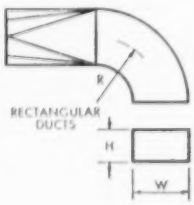
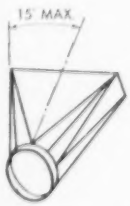
1 INLET CONNECTIONS are the largest single factor determining fan performance. Connection a, above, with smooth flow into inlet, is best but seldom possible. Connection b, below, with elbow, is frequently necessary and often results in loss of air delivery, decreased efficiency, and increased horsepower



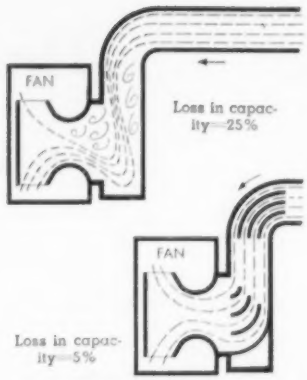
2 WORST TYPE of inlet connection is box a, above, and b, below, whose performance is almost impossible to tabulate because of its numerous variations. Turbulence set up by air flowing into rectangular corners may decrease capacity by 50 percent

Tear out along this line

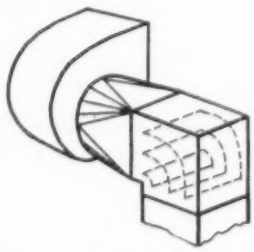
HPAC DATA SHEET

DESCRIPTION		% LOSS IN CFM
3 PIECE ELBOW	R/D = .5	10—12
	= 1.0	4—6
	= 2.0	3—5
	= 4.0	3—5
	= 6.0	3—5
4 PIECE ELBOW	R/D = 1.0	4—6
	= 2.0	2—4
	= 4.0	2—4
	= 6.0	2—4
	= 8.0	2—4
5 OR MORE PIECE ELBOW	R/D = 1.0	3—5
	= 2.0	2—4
	= 3.0	2—4
	= 4.0	2—4
MITERED ELBOW		14—16
SQUARE DUCTS WITH VANES		
A B C D SQUARE DUCTS	No. Vanes	15—17
	A.	6—8
	B.	4—6
	C.	3—5
	D.	2—4
ROUND TO SQUARE TO ROUND	**ROUND TO SQUARE TO ROUND WITH VANES**	6—8
RECTANGULAR DUCTS		
 RECTANGULAR DUCTS	H/W = .15 R/W = .5	4—6
	= 1.0	2—4
	= 1.5	2—4
	= 2.0	2—4
	H/W = .25 R/W = .5	5—7
	= 1.0	2—4
	= 1.5	2—4
	= 2.0	2—4
	H/W = .50 R/W = .5	7—9
	= 1.0	2—4
	= 1.5	2—4
	= 2.0	2—4
THE EFFECT OF RECTANGULAR TO ROUND TRANSITION PIECE CAN BE IGNORED UNLESS IT IS VERY LONG, IN WHICH CASE IT WILL BE BENEFICIAL DUE TO PUTTING FAN AWAY FROM ELBOW.	H/W = 1.0 R/W = .5	10—12
	= 1.0	3—5
	= 1.5	2—4
	= 2.0	2—4
	H/W = 2.0 R/W = .6	9—11
	= 1.0	3—5
	= 1.5	2—4
	= 2.0	2—4
 15° MAX. MAXIMUM ANGLE SHOULD NEVER EXCEED 15°, WHERE IT DOES ADDITIONAL LOSSES OCCUR	H/W = 4.0 R/W = .6	13—15
	= 1.0	6—8
	= 1.5	2—4
	= 2.0	2—4
	H/W = 6.0 R/W = .7	10—12
	= 1.0	4—6
	= 1.5	2—4
	= 2.0	2—4

3 FAN PERFORMANCES resulting from several common types of fan inlet connections are shown here. Where the best possible performance or maximum efficiency is demanded, the use of turning vanes is recommended



4 TURNING VANES in connection b, below, which distribute air evenly across the fan inlet may reduce loss in capacity by 20 percent in connections of this type



5 SQUARE DUCT ELBOWS have a capacity loss of about 16 percent without vanes and 3 percent with vanes. Three or four vanes are usually best

the air evenly across the inlet. In this type of inlet box, the rectangular duct should be no wider than necessary and deep enough to maintain the same cross-sectional area as the fan inlet.

The best, but most space consuming, way to minimize fan inlet loss is to insert a straight duct between fan and elbow or inlet box. For the better elbows, the straight duct should be at least five or preferably 10 diameters long. For the poorer elbows and inlet boxes, it should be at least 10 diameters long.

No single factor so affects the fan's performance as the design of the inlet connection. In addition to giving delivery, a good inlet connection tends to make the system quieter and more stable.

The table is reasonably accurate, and if used either for designing or field corrections it will produce better fan performance. ⫩

HEATING, PIPING & AIR CONDITIONING

AMERICAN SOCIETY OF
HEATING AND AIR-CONDITIONING ENGINEERS

Journal Section

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TEMPERATURE AND HUMIDITY EFFECT ON ODOR PERCEPTION

By W. F. Kerka* and C. M. Humphreys**, Cleveland, Ohio

This paper is the result of research carried on by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS at its Research Laboratory located at 7218 Euclid Ave., Cleveland 3, Ohio.

SUMMARY — An increase in humidity has a definite effect of lowering the odor-perception level of cigarette smoke as well as pure vapors. Organoleptic appraisals of perception intensities made over a wide range of temperatures and humidities reveal that this effect is more pronounced for some odorants than for others. An increase in temperature at constant specific humidity lowers the odor level of cigarette smoke slightly. The effect of temperature upon the three pure vapors studied is not so consistent.

Adaptation to odors takes place more rapidly during the initial stages of exposure. While the perceptible odor level of cigarette smoke decreases with time of exposure, irritation to the eyes and nose generally increases. The irritation is greater at low relative humidities (below 35 percent) than above 50 percent.

THIS paper is the first of a series dealing with odor problems in air-conditioned spaces. The purpose of this study was to determine the effect of temperature and humidity upon odor perception. Odor-level evaluations of 3 pure vapors and of cigarette smoke were made using the organoleptic-panel technique. The results were plotted on the psychrometric chart and perception trends were determined. The effect of olfactory adaptation was studied by exposing panel members to a fixed concentration of odorant, and determining the perception levels at specified intervals of time.

The perception trends thus established serve only as a guide, and restrictions should be placed upon them when considering their applicability to an actual case. The concentration of odorants outdoors as well as in occupied spaces varies with changes in temperature and humidity. As an odor source is heated, it gives off more odorant, and in air-conditioned spaces where dehumidification takes place, water soluble odorants are removed along with the condensate on the surfaces of the coil. Hence what may be mistaken for effects of temperature and humidity upon odor perception may actually be variations in odor concentration. The study of the effect of temperature and humidity upon odor perception was conducted with constant concentrations of odorants.

*Research Engineer, ASHAE Research Laboratory, Member of ASHAE.
**Assistant Director of Research, ASHAE Research Laboratory, Member of ASHAE.
[1]Exponent numerals refer to Bibliography.
For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Washington, D. C., June 1956.

Test Apparatus

Test Rooms: Odor appraisals were made in 2 test rooms[1], separated by a corridor, and located in the main Laboratory of the ASHAE Research Building. The rooms measured 8 × 12 × 8 ft high and were lined with porcelain enameled steel having low odor-adsorption qualities. Test-room doors were weatherstripped to reduce infiltration of outside air. Inlet air was filtered and deodorized by passing through 2 banks of mechanical filters, an electrostatic precipitator, 2 banks of activated carbon canisters, and finally through an absolute filter. Air from the rooms was not recirculated, but was exhausted to the outdoors. Three separate systems, serving the 2 rooms and the corridor, contained the necessary equipment for cooling, heating, and humidification. Air flow was regulated by adjustable dampers on the inlet side of the supply fans, and metering orifices were used to measure the flow rates. The odorant was introduced into the air-supply duct and thoroughly mixed with the air stream by 4 baffles.

Odor Introduction Apparatus: The apparatus used for the introduction of pure odorous vapors consisted of 2 gas-washing bottles in series through which nitrogen was bubbled (Fig. 1). Nitrogen was used in place of air since it was less likely to react chemically with the odorant. The nitrogen was passed through beds of silica gel and activated carbon to remove inherent moisture and odor before it was metered by a rotameter into the bubblers.

Static pressure at the inlet to the rotameter measured 0.5 in. Hg for a flow rate of 15 ml per min and 0.6 in. for a flow rate of 1.2 liters per min, the range used in the perception studies. The nitrogen leaving the second bottle was saturated with vapor and entered the air-supply duct via a tube, heated with a resistance tape to prevent condensation. The apparatus was constructed of glass, and ground joints were used (after the bed of activated carbon) to prevent contamination. The gas-washing bottles were surrounded by a controlled temperature water bath. The concentration of odorant was calculated from its vapor-pressure properties, the amount of nitrogen bubbled through the washers, and the quantity of air supplied to the test room. The concentration was checked by adsorbing the odorant on activated carbon and measuring the increase in weight.

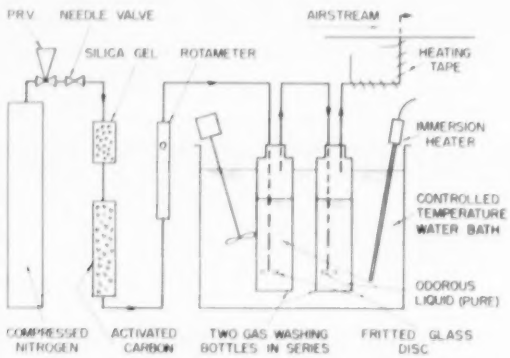

Fig. 1 Schematic drawing of odor introduction apparatus (pure vapors)

Table 1—Sensory Scale for Evaluating Intensity Levels

Degree of Odor Intensity	Description
0	Odorless
1	Threshold
2	Definite
3	Strong
4	Overpowering

The apparatus for producing cigarette smoke used the same components as the one just described, except that a bell jar was substituted for the washing bottles, and compressed air was used in place of the nitrogen. The cigarettes were allowed to burn freely on a screen platform suspended 3 in. above the base of the jar which rested in a pan of water acting as an air seal. Combustion air was admitted through a tube at the base of the jar, passed around the cigarettes, and the combustion products were removed through a 1-in. steel tube leading to the air-supply duct. The tube was heated to prevent condensation of the products of combustion. In a second smoke-producing method, the cigarettes were allowed to burn freely in the test rooms on a screen platform. In a third method, human smokers, seated in the rooms, puffed at their normal rate. A maximum of 3 smokers was employed. The same popular brand of king-size cigarettes was used for all test runs.

Temperatures and humidities were determined from the readings of wet- and dry-bulb thermocouples located in each room. The wet-bulb thermocouple was made by inserting a copper-constantan junction into a ¼-in. brass tube filled with solder. A wetted wick surrounded the tube and extended along the leads for about 1½ in.

The Organoleptic Panel: The organoleptic panel technique[2] was used in making judgments of odor intensity and quality. The panel consisted of 6 members from a staff of 12 people who had been trained in odor appraisal for several months before the beginning of the test runs. The panel was about equally divided between men and women, and moderate smokers and non-smokers. Four of the panel members served continuously, while the other 2 were selected from the remaining staff on the basis of their availability at the time of the test. Subjects were requested not to smoke less than ½ hr before each test. Persons having colds were excused from the panel and alternates used in their places.

Test Procedure

In evaluating the intensity levels for pure vapors, the sensory scale of Table 1 used by Gee[3] was adopted.

The score of 1 indicated a recognition *threshold*. A score of ½ was used when the panel member detected the presence of an odor, but felt its intensity was not great enough to identify its quality. An intensity level between *threshold* and *definite* was scored 1½, and so on.

When preliminary tests on tobacco smoke were begun, the panel members felt that the word description of the sensory scale used for pure vapors did not sufficiently represent their reactions. As a result the sensory scale used by Yaglou[4] (Table 2) was adopted for all cigarette-smoke evaluations.

Subjects recorded separately the degree of odor and irritation, also

Table 2—Sensory Scale for Tobacco-Smoke Evaluations

Degree, Odor or Irritation	
0	*Imperceptible* odor, or irritation.
1	Perceptible odor, or irritation, but *not objectionable*.
2	Moderate odor, or irritation, little or no objection, *acceptable* level.
3	*Objectionable* odor, or irritation; condition regarded with disfavor.
4	Strong odor, or irritation, but *endurable*.
5	Very strong odor, or irritation, *intolerable*.

place of irritation (eyes, nose, or throat).

Selection of Odorants: The three pure vapors selected for investigation were iso-valeric acid, methyl salicylate, and pyridine. Their odors respectively are sour and footy, fragrant and cool, and burnt and nauseating. During all of the tests, the concentration of each odorant was held constant and was the same in each room.

The cigarette smoke was generated in the bell jars and introduced into the air-supply ducts at a constant rate, controlled by the number of burning cigarettes and the amount of combustion air. During all of the test runs (pure vapors and cigarette smoke) the ventilating rate to each room was fixed and only the temperatures and humidities were varied.

Panel Technique: When the desired test conditions were established in the rooms, subjects were called from their normal work routines (calculating, typing) to make odor appraisals. Each subject entered a test room alone, normally clothed, and without knowing whether the conditions would be more or less humid than in the previous test. After walking to the center of the room, the person sniffed for a first impression, then exhaled, and about 5 sec later sniffed again for a second impression. He then circled a number indicating his judgment of the odor intensity and also noted his impression of the odor quality on a form which he carried. In tests with tobacco smoke, the degree of irritation was also noted. After a rest of about 2 min in the Laboratory, the subject entered the second test room and repeated the foregoing procedure. The slip bearing the appraisals for the 2 tests was submitted to the test engineer. Subjects were asked not to discuss their judgments with each other, to prevent the impressions of one being influenced by the impressions of another.

It was possible for the judgments in the second room entered to be influenced by adaptation to the odor. To eliminate this effect, during each test half of the panel members first entered Room No. 1 and then Room No. 2, while the other half entered the rooms in the reverse order. Also the conditions in the rooms were changed after each run so that the odor level at a particular temperature and humidity judged in one room was also judged in the other. At least 1 hr was allowed between each run and no more than 6 runs were made each day.

The conditions selected for study ranged from 55 F to 110 F (dry bulb) and 20 to 80 percent RH (relative humidity) (10 to 40 percent above 95 F). The test pattern was set up so that one dry-bulb temperature was selected each day and the relative humidities varied by 10 percent intervals. Table 3 illustrates a test pattern.

The same constant dry-bulb temperature and odor concentration was maintained in both rooms during all 6 runs. A run consisted of 6 appraisals made in each of the 2 rooms.

During some test series, the relative humidities were selected in decreasing rather than increasing order.

The dry-bulb temperatures themselves were chosen in random order. The panel member was never told what test condition prevailed.

A possible shift in the appraisals of the panel members over a period of time could give misleading results, especially if an orderly sequence of conditions were investigated. For this reason during each of the temperature-humidity *vs* perception level studies, the dry-bulb temperatures were investigated at random rather than in consecutive order. At regular intervals, extra runs were made (unknown to the panel members) at concentrations other than the fixed value

Table 3—Example of Test Pattern

Run No.	Relative Humidity	
	Room 1	Room 2
1	50	40
2	40	50
3	50	60
4	60	70
5	70	80
6	80	50

used during the tests. This was done to check the responsiveness of the panel members and to reorient them in their appraisals.

It was originally planned to use the central corridor as a preconditioning chamber; but, at the beginning of the program the panel members reported that this area became contaminated with odorant as a result of opening the doors to the test rooms, even though a high ventilating rate was used in the corridor. Since any exposure to the odorant, immediately preceding an evaluation, could not be permitted, the method was abandoned and the subjects entered the test rooms directly from the Laboratory. All of the tests were conducted during the winter and early spring. Daily measurements in the Laboratory showed a fairly constant condition of 76 F dry-bulb and 30 percent relative humidity. The panel members remained in this environment for at least a minute before making their first appraisal. Since the static pressure in the test rooms was maintained at a few hundredths of an inch of water less than in the

Laboratory, contamination of the surroundings was no serious problem under normal operation. After each day of testing, the rooms were cleansed by admitting humid air at a dew-point temperature above the temperature of the wall surfaces, and then evaporating the resulting film deposited on the surfaces by introducing warm dry air. The floors were washed daily with warm water and detergent and periodically the walls were wiped by the same method.

Equilibrium Conditions: During the test runs to establish perception trends for pure vapors, the air flow and admission of odor were maintained at constant values throughout a day of testing. Since the air and odorant distributed to each room equaled the amount exhausted, a continuous steady-state was possible. During the cigarette-smoke tests, the free-burning time for king-size cigarettes in the bell jar was about 25½ min. The cigarettes were lighted and allowed to burn for 10 min, and then appraisals were made during the last 15 min of the burning period. At the end of each run, the jars and screen platforms were cleaned of residue ash. In the tests where the cigarettes were humanly smoked or allowed to burn freely in the test rooms, a smoking period of about one-half hour was allowed before evaluations were made.

Treatment of Data: Tabulations of the arithmetic mean scores (each score being the mean of 12 appraisals) for the odor intensities of iso-valeric acid, methyl salicylate, pyridine, and cigarette smoke were made, and were based on the initial impression of odor level. These tabulated mean scores were used in plotting constant dry-bulb temperature lines, illustrated for tobacco smoke in Fig. 2. As an example, the values for 70 F dry bulb in Fig. 2 were obtained by averaging the mean scores at 65 F, 70 F, and 75 F. The odor level scores, obtained from the intersection of the constant-temperature and the relative-humidity lines, were plotted on the psychrometric chart, Figs. 3 through 6. From these values, the perception intensity areas were charted. This method of cross plotting was used since the individual scores were not sufficiently consistent for a direct interpretation.

A tabulation of the median scores was also made. These were plotted on graphs identical to Fig. 2 and constant dry-bulb temperature lines were drawn. The trend and displacement of these lines were substantially the same as the ones obtained from the arithmetical mean scores; however, the median scores were less consistent than the means and it was more difficult to fit a curve to a series of points.

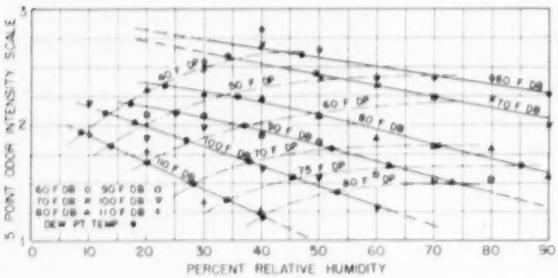

Fig. 2 Odor intensity vs. percent relative humidity (constant temperature lines for cigarette smoke)

Discussion of Results

The perception areas for iso-valeric acid were drawn as three bands in Fig. 3. The results indicate that the perception level for iso-valeric acid decreases as the relative humidity increases at a constant dry-bulb temperature. This trend becomes more evident at the higher temperatures investigated. The effect of temperature alone can be determined by moving along constant dew-point temperature (constant specific humidity) lines. Below about 70 F dew point the odor level falls off with an increase in dry-bulb temperature. At higher dew-points, the perception level appears to rise slightly with an increase in temperature.

The perception trends for methyl salicylate are shown in Fig. 4. It was found that some of the individual scores between 55 F and 70 F dry-bulb, first rose, then fell, with an increase in relative humidity from 30 percent to 80 percent. This trend was confined to the lower temperatures, since above 75 F dry bulb, the perception level scores decreased rather uniformly with an increase in relative humidity at constant dry-bulb temperature. This apparent reversal in odor level was not supported by sufficient data and did not manifest itself in the constant dry-bulb temperature lines from which Fig. 4 was drawn. The data were too inconsistent to show any definite effect of temperature upon odor perception. If the values at 90 F dry-bulb (Fig. 4) were more in line with the values at 80 F and 100 F, however, it would

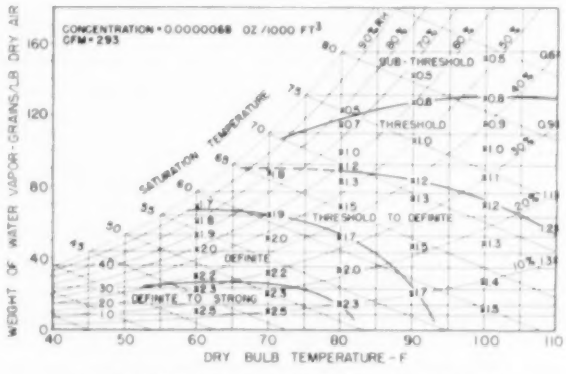

Fig. 3 Odor perception trends for iso-valeric acid

appear that an increase in temperature at constant specific humidity would cause a general decrease in perception level. The lines separating the perception areas are shown broken where their position is open to question.

The perception areas for pyridine are shown in Fig. 5. At low dry-bulb temperatures (47 F to 65 F), the scores indicated an increase in perception level with an increase in relative humidity to about 40 percent. This trend was evident in the constant dry-bulb temperature lines from which Fig. 5 was drawn. Above this humidity the scores leveled off to about a *definite* rating. Above 75 F dry bulb, however, the odor intensities decreased rather uniformly with an increase in relative humidity at constant dry-bulb temperature. An increase in temperature at constant specific humidity causes a slight drop in perception below about 60 F dew point. Above this value the effect appears to reverse itself.

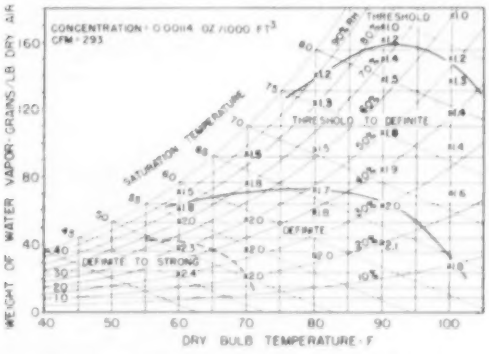

Fig. 4 Odor perception trends for methyl salicylate

The odor perception areas for cigarette smoke, Fig. 6, form 3 distinct bands. Figs. 2 and 6 indicate a general decrease in odor perception level with an increase in relative humidity at a constant dry-bulb temperature. The trend becomes more evident at the higher temperatures investigated. An increase in dry-bulb temperature at constant specific humidity also causes a decrease in perception level. This drop in level becomes more noticeable as the temperature increases. The values in Fig. 6 indicate odor intensity only. Initial effects of irritation either to the eyes, nose, or throat were recorded separately, but the results were less consistent than the odor intensity scores, although the same general trend was followed.

In Figs. 3 through 5 the lines separating the perception areas do not represent sharp cleavages in odor levels, but serve only as general boundaries between transition scores. Examination of the perception trends for the 3 pure vapors reveals that the odor intensity of iso-valeric acid drops more rapidly with an increase in relative humidity at constant dry-bulb temperature than either methyl salicylate or pyridine.

Physical Significance of Perception Trends: The words used in the sensory scales, as indications of odor intensity, can be given a very real and significant meaning if odor level evaluations are made over a wide range of odorant concentration. Fig. 7 shows evaluations of iso-valeric acid and methyl salicylate and 2 other pure vapors, n-butyric acid and iso-amyl acetate, plotted against the logarithm of the concentration. During these tests, the conditions were maintained at 79.5 F dry-bulb and 22 percent RH. The air supply was held at 284 cfm (22 air changes per hour). Pyridine was not evaluated as its odor was too nauseating at higher concentrations. Fig. 7 indicates that the physical concentration must be increased tenfold to raise the odor intensity by one point. Hence, to raise the score two points in odor level, requires a hundredfold increase in concentration. This is in accordance with the Weber-Fechner

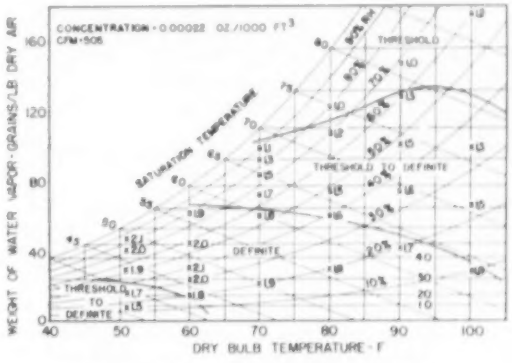

Fig. 5 Odor perception trends for pyridine

Law. The relationship appears to hold true for the mid-point of the odor scale but may deviate at the ends[5].

Therefore, in Figs. 3 through 5, any increase in humidity at a given dry-bulb temperature that lowers the odor intensity from a *definite* to a *threshold* level, has the same effect as reducing the physical concentration of odorant by 90 percent. Likewise, any decrease in odor level of one-half point due to either an increase in humidity at constant dry-bulb temperature or an increase in temperature at constant specific humidity has the same effect as decreasing the physical concentration of odorant by about 67 percent.

The physical significance of the perception areas for cigarette smoke is shown by Line A in Fig. 8. The ventilating rate must be increased about sixfold to reduce the odor level by a full point. The area of *perceptible* to *moderate* odor level in Fig. 6, therefore, has an apparent ventilating rate 6 times as great as the *moderate* to *objectionable* odor level.

It should be pointed out that, if the sensory scale used for pure vapors were superimposed on Fig. 8, the ventilating rate for Line A would then have to be increased tenfold for a one-point drop in odor level of the four-point scale. This is compatible with the results for pure vapors, since 1.3 points on the tobacco-smoke sensory scale equals one point on the pure-vapor scale.

A discrepancy occurs between the odor level evaluations of iso-valeric acid in Figs. 3 and 7. At a concentration of 0.0000068 oz. per 1000 cu ft, the intensity was judged at about *definite* (80 F and 20 percent RH) in Fig. 3, while in Fig. 7 at the same concentration it was rated at about *threshold*. It is possible for a shift in judgments to occur. In all probability the points for iso-valeric acid in Fig. 7 could be moved to the left, at the same slope, however.

Effect of Temperature and Humidity Upon Odor Quality: During the perception trend studies, the panel members reported that little if any change in odor quality occurred over the range of temperatures and humidities investigated. The sensation of the inhalation appeared to be *heavy* at low temperatures, however, and *lighter* at high temperatures..

Odor Adaptation: During the perception trend studies the impression of the first inhalation experienced by a subject was in the majority of cases higher than the impression of the second inhalation. This would indicate that adaptation to odors takes place with the first inhalation. Several panel members reported from time to time that the strength of an odor diminished during an extended initial sniff.

To illustrate the effect of odor adaptation, the panel members were exposed to a constant physical concentration of odorant for a given period of time. The member entered the test room and sniffed immediately for an initial impression. Breathing normally through the nose, judgments were made every 15 sec for the first minute and every minute thereafter for a maximum of 6 min.

Fig. 9 gives the results for each of the 3 pure vapors plus iso-amyl acetate, and n-butyric acid. Each point represents the mean score of 6 to 8 judges. The concentration was adjusted to give initial readings between 2 (*definite*) and 3 (*strong*). In all of the tests, adaptation was

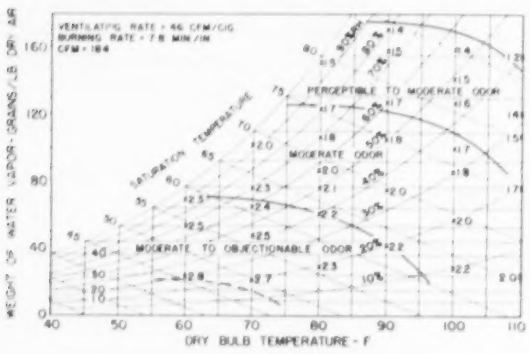
VENTILATING RATE = 46 CFM/CIG
BURNING RATE = 7.8 MIN./IN
CFM = 184
PERCEPTIBLE TO MODERATE ODOR
MODERATE ODOR
MODERATE TO OBJECTIONABLE ODOR
SATURATION TEMPERATURE °F
WEIGHT OF WATER VAPOR - GRAINS/LB DRY AIR
DRY BULB TEMPERATURE - F

Fig. 6 Odor perception trends for cigarette smoke

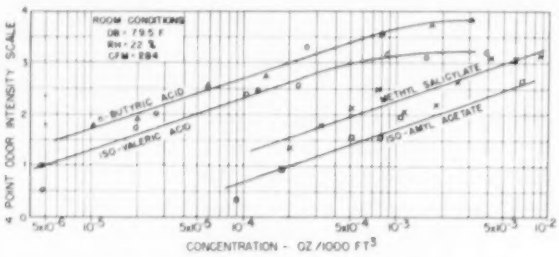

Fig. 7 Odor intensity vs. concentration

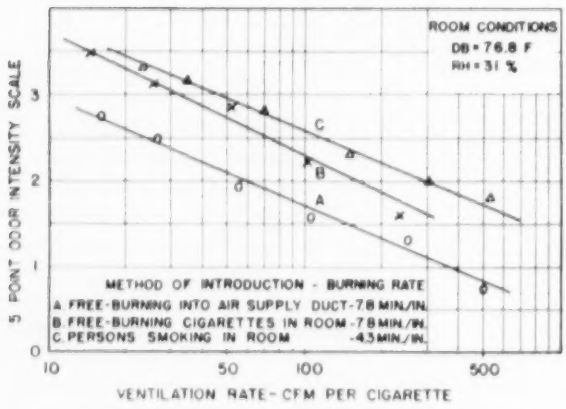
ROOM CONDITIONS
DB = 76.8 F
RH = 31 %
METHOD OF INTRODUCTION - BURNING RATE
A FREE-BURNING INTO AIR SUPPLY DUCT-7.8 MIN./IN.
B FREE-BURNING CIGARETTES IN ROOM-7.8 MIN./IN.
C PERSONS SMOKING IN ROOM -43 MIN./IN.
5 POINT ODOR INTENSITY SCALE
VENTILATION RATE - CFM PER CIGARETTE

Fig. 8 Odor intensity of cigarette smoke vs. ventilation rate

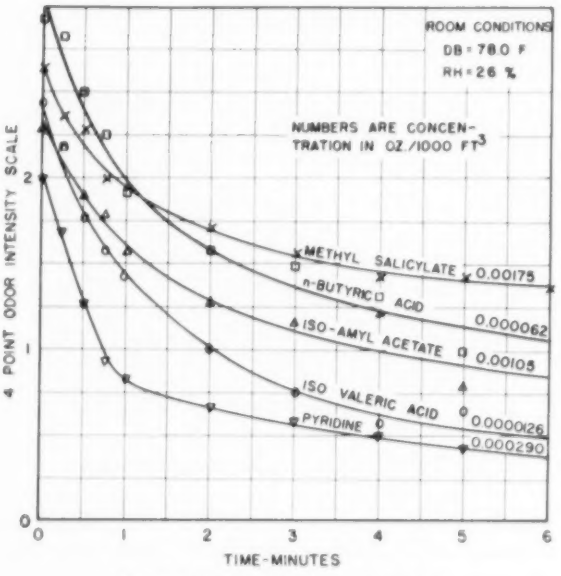

Fig. 9 Adaptation to pure-vapor odors

greatest during the first stages of exposure. The curves for iso-valeric acid and n-butyric acid are nearly the same shape (although displaced), indicating an identical adaptation rate. In all of the tests the conditions were maintained at 78 F dry-bulb and 26 percent RH.

Adaptation to Cigarette Smoke: Figs. 10 and 11 give the evaluations for exposure to cigarette smoke under 30, 47, and 65 percent RH and at the same dry-bulb temperature of 77 F. For each humidity the smoke was introduced into the rooms by each of 2 methods: (*a*) free-burning directly in the room (Fig. 10), and (*b*) free-burning in the bell jars with the smoke introduced into the air-duct system (Fig. 11). The ventilation rate was maintained at 14 cfm per cigarette for both methods, and the burning rates were the same ($25\frac{1}{2}$ min per cigarette). Besides recording odor levels at given intervals of time, the panel members evaluated effects of irritation either to the eyes, nose, or throat.

The results show a higher rating of irritation and odor level at all 3 humidities when the panel members were exposed to the smoke generated directly in the rooms. This points to the removal of some of the odorous and irritating components by condensation or adsorption on the surfaces of the air duct, when the smoke was introduced into the air stream.

Under the 30 percent RH condition, odor levels and irritation levels (confined mostly to the eyes and nose) were greater than the odor and irritation levels at 47 and 65 percent RH. This was noted for both methods of cigarette-smoke introduction.

General Discussion of Results — Cigarette Smoke: The problem of mechanically producing measurable quantities of tobacco smoke, which is representative of human puffing, has no ready solution. The nicotine content in the smoke varies with the strength of puff, moisture content in the tobacco, and length of the unburned portion[6]. Yaglou[4] describes the effect of nicotine on both smokers and non-smokers; his use of actual persons smoking at normal rates is perhaps the most realistic approach to the problem.

While the authors admit the free-burning method does not duplicate human action, it does afford a simple and economical means of generating reproducible quantities of smoke. Kuehner[7] states that artificial burning, regardless of combustion rate, degree of freshness of tobacco, or brand, results in a uniform production of odor per unit weight of tobacco burned, and that a constant difference exists between human and mechanical smoking because of the absorption of odor in the respiratory system.

The perception trends for cigarette smoke (Fig. 6), although not derived under conditions that duplicate human smoking, could be adjusted in value to represent such a condition.

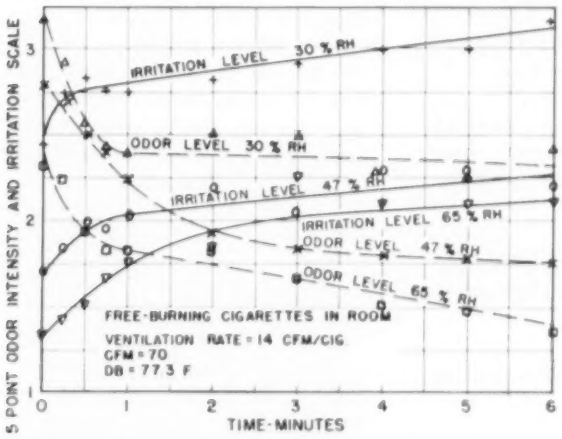
5 POINT ODOR INTENSITY AND IRRITATION SCALE
TIME-MINUTES
IRRITATION LEVEL 30 % RH
ODOR LEVEL 30 % RH
IRRITATION LEVEL 47 % RH
IRRITATION LEVEL 65 % RH
ODOR LEVEL 47 % RH
ODOR LEVEL 65 % RH
FREE-BURNING CIGARETTES IN ROOM
VENTILATION RATE = 14 CFM/CIG
CFM = 70
DB = 77.3 F

Fig. 10 Adaptation to cigarette-smoke odor, and irritation caused by cigarette smoke generated in room

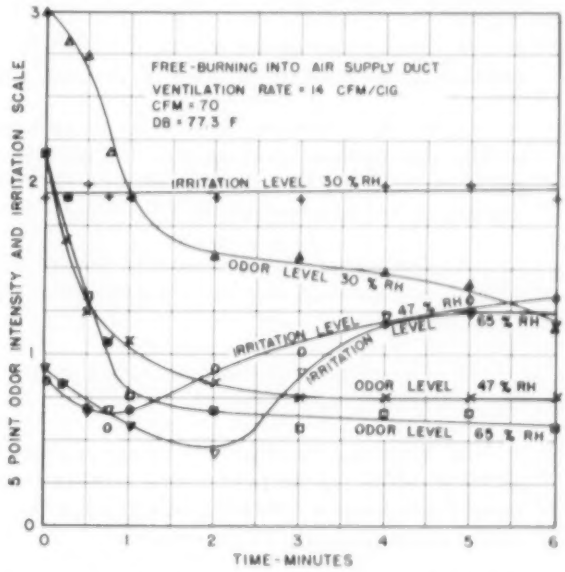
5 POINT ODOR INTENSITY AND IRRITATION SCALE
TIME-MINUTES
FREE-BURNING INTO AIR SUPPLY DUCT
VENTILATION RATE = 14 CFM/CIG
CFM = 70
DB = 77.3 F
IRRITATION LEVEL 30 % RH
ODOR LEVEL 30 % RH
IRRITATION LEVEL 47 % RH
IRRITATION LEVEL 65 % RH
ODOR LEVEL 47 % RH
ODOR LEVEL 65 % RH

Fig. 11 Adaptation to cigarette smoke odor, and irritation caused by cigarette smoke introduced with supply air

In Fig. 8 the difference in odor level between cigarette smoke introduced into the air-supply duct (Line A) and smoke produced by human smokers (Line C) is evident. At all values of cfm per cigarette the odor level of Line C is equally displaced above Line A. Line B represents evaluations of the odor level of tobacco smoke generated by free-burning cigarettes located in the rooms. The displacement of Line B above Line A again points to the adsorption and condensation of odorous components on the surfaces of the air duct. The burning time for cigarettes used in the evaluations of Lines A and B was 25.5 min per cigarette or 7.8 min per in. The burning rate for the cigarettes smoked by persons (Line C) was about 4.3 min per in. Although some of the odor is absorbed in

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the respiratory system, the greater amount of tobacco burned per minute, and possibly the inhalation of air through the unburned portion, produces a higher odor level than the free-burning method at the same ventilating rate. The displacement of Line C above Line B appears to confirm this. In order to compare the evaluations of Line C with Line B on the basis of cubic feet per minute per weight of cigarette burned in a given period of time, Line C would be displaced to the left by the ratio of the burning rates.

From the results shown in Fig. 8, the perception areas for cigarette smoke in Fig. 6 could each be rated about one point higher had the evaluations been made on tobacco odors produced by persons smoking in the test rooms at the same ventilating rate as the free-burning method used. However, if the effect of temperature or humidity upon the perception intensity of tobacco-smoke odor produced by human puffing is different from the effects on tobacco odor produced by the method used in the perception trend studies, then the preceding statement would not apply.

CONCLUSIONS

1. An increase in humidity at constant dry-bulb temperature tends to lower the intensity level of an odor.

2. The extent of the effect of humidity upon odor perception is not the same for all of the odorants studied.

3. At temperatures below 70 F, an apparent reversal in the perception level occurs for methyl salicylate and pyridine, with an increase in relative humidity. More data are needed to substantiate this, however.

4. The odor level of cigarette smoke decreases slightly with an increase in dry-bulb temperature at constant specific humidity.

5. Olfactory adaptation occurs more rapidly during the initial stages of exposure.

6. Exposure to cigarette smoke over extended periods of time, while causing olfactory adaptation, will generally have a progressive irritating effect upon the eyes and lining of the nasal passages of the observer.

7. Both sensory scales used in these tests demonstrate that the odor perception level is a function of the logarithm of the concentration.

General Discussion of Perception Trends: It had been planned to establish more specific trends in perception intensity; however, the difficulty in obtaining uniformly consistent scores did not make this possible. During the tests, the panel members could make direct comparisons between odor intensities at different relative humidities for the same dry-bulb temperature, but in general no direct comparison was made between the levels at different dry-bulb temperatures. For example, the evaluations made at 80 F dry bulb were made at least a week after the evaluations made at 75 F or 85 F. Hence the subject had to rely completely on the word description of the sensory scale, since the memory of an exact odor level from the preceding week was next to impossible.

Making judgments on this absolute basis has its disadvantages since fluctuations and deviations in scores are difficult to account for. Using one room as a standard environment and comparing this with the evaluations made in the test room would be a more accurate approach; however, such a method would be more time consuming.

Although the perception areas in this paper show a general trend, more data are needed to determine a locus of points representing constant odor intensities. When these are available, the effect of temperature upon odor perception will be more clearly shown.

Acknowledgments

The authors wish to express their gratitude to Amos Turk, A. H. Gee, and other members of the Technical Advisory Committee on Odors for their valuable suggestions and guidance throughout the test program.

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Performance of One-Row Tube Coils with Thin-Plate Fins, Low Velocity Forced Convection

By D. G. Shepherd*, Ithaca, N. Y.

SUMMARY—Data are presented for heat transfer and pressure drop for forced convection of air at velocities of 200 to 1000 fpm over a single row of tubes with continuous thin plate fins. The finned-tube matrices were of the kind commonly used in small refrigerating and air-conditioning units. Figures are given from which the performance of a given coil may be estimated, covering a range of fin depth from 1 to 2 in., 3 to 11 fins per inch, tube pitch/tube diameter from 2.33 to 5.12 and fin thickness 0.008 to 0.011 in.

HEAT exchange matrices of tubes with continuous plate fins of small thickness are commonly used in refrigeration and air-conditioning systems with air flowing over the fins. The matrix or coil may have more than one row of tubes, but the fins are formed from a single sheet fitted over all the tubes. A matrix with a single tube row is shown in Fig. 1. Data exist for many types of finned surface, but the majority are of limited scope with respect to the many variables of tube and fin geometry. This investigation was undertaken to explore systematically the effects of tube size, spacing and location and the effects of fin size, spacing and thickness.

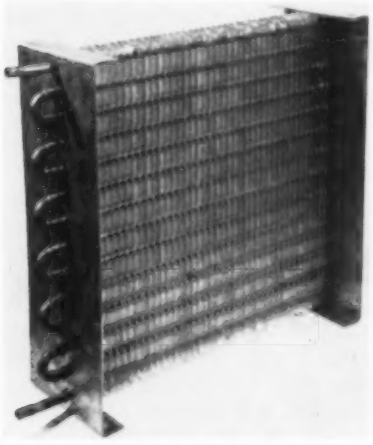

Fig. 1. Typical coil

The results reported are confined to the characteristics of coils with a single row of tubes. Investigations are in progress on two-row coils and further work is envisaged on the effect of corrugations on one row plate-finned coils.

The coils were constructed in commercial fashion and dimensional tolerances were not restricted beyond normal industrial practice. Some of the small differences which occurred will be noted later, but none seem of sufficient magnitude to throw doubt on the overall validity of the results. Thus the results are directly applicable to the normal use of this particular type of coil.

Method of Test

The heat transfer characteristics were obtained by flowing air at room temperature over the finned side of the coils and circulating water at 150 to 170 F through the tubes. The rate of heat transfer was found from measurements of air flow and temperature rise and of water flow and temperature drop, the heat balance obtained in this manner being checked before any data were used. The unit conductance on the air side was obtained from the overall conductance by means of the *Wilson Plot*.[1,2,3] The essence of this method is that since the overall resistance to heat transfer is equal to the sum of the individual resistances in series, by holding all resistances but one constant and varying that one, a line can be drawn which if extrapolated to a zero value of the variable resistance gives an intercept which is the sum of the other resistances. In this case there are three resistances in series, the air-side resistance, R_a, the water-side resistance, R_w, and the resistance of the tube wall, R_t. The last named is negligible, typical values being of the order of $R_a = 0.1$, $R_w = 0.001$, and $R_t = 0.0001$, all values in (hours) (square feet) (Fahrenheit degrees)/Btu, and thus a plot of the overall resistance R_o against R_w yields R_a as intercept.

A closer analysis (see Appendix A*) shows that if R is taken as reciprocal of h, the unit conductance, that is exclusive of the associated area, then

$$R_o = (A_a/A_w)\, R_w + R_a \qquad (1)$$

Equation 1 shows that a plot of R_o *vs* R_w should have a constant slope equal to A_a/A_w. Thus when one line has been determined, other lines with different air flow rates can be determined with relatively few points, since the slope of the line is known. This should also be true of different coils, since the resistance on the water side is unchanged in nature by a variation of the air side arrangement. If a relation for R_w is known exactly, then the slope is known initially, but it is best to plot R_w in terms of the variables without including the constant, as this is the largest source of uncertainty. Thus originally in this investigation, R_w was calculated from the well-known expression (Reference 2, page 168):

$$hd/k = 0.023\,(dG/\mu)^{0.8}\,(c\mu/k)^{0.4} \qquad (2)$$

Use of this expression did not result in the same slope as given by the experimental observations, and thus R_w was plotted in terms of the water velocity, tube diameter and a temperature term embracing the variation of fluid properties, c, μ, k, and ρ. Equation 2 is recommended only

*Professor, Thermal Engineering, Sibley School of Mechanical Engineering, Cornell University. For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Washington, D.C., June 1956.

[1]Exponent numerals refer to References.

*Appendices to be published with this paper in TRANSACTIONS.

to give values within ±20 percent and therefore in spite of its wide utility, complete agreement is not to be expected.

Equation 2 can be put into a simple form because the fluid properties can be accounted for by a linear temperature term for the narrow range of these tests in which the mean water temperature is between 125 and 160 F. The final form was

$$R_w \propto (d_i^{1.8})/[m_w^{0.8}(1 + 0.01 t_{wm})] \quad (3)$$

where

t_{wm} = arithmetic mean water temperature, Fahrenheit.

The great majority of tests showed that the slopes of the R_o *vs* R_w lines agreed with the predicted slope from the surface-area ratio, but there were exceptions discussed later.

The method of testing was then as follows: After thermal equilibrium was obtained, readings were taken at constant air and water flow rates. If a heat balance was obtained within 5 percent, then with the same air flow, the water flow was changed to a new setting and readings taken when equilibrium was obtained. The number of different water flow rates at each value of air flow varied, usually being a minimum of three but often greater if necessary to confirm the line with the calculated slope. The majority of coils could be grouped in threes, differing only in fin spacing. For each new group, sufficient water points were taken on the initial run to determine whether the theoretical slope was the correct one; in no case was the theoretical slope used in conjunction with only one or two experimental points.

The range of air flow was from about 15 lb per (min) (sq ft) to 75 lb per (min) (sq ft), corresponding to approach velocities of 200 fpm to 1000 fpm, with the initial pressure and temperature being atmospheric. The water flow rate varied between about 1.2 and 6 fps, with the inlet temperature varying between 150 and 170 F.

The overall thermal resistance, R_o, was calculated from the rate of heat transfer, q, by means of the relation

$$R_o = (A_a \theta_m)/60\, q_w \quad (4)$$

The surface area was computed from the coil geometry as the sum of the flat surface of the fins and exposed tube surface. The area of the edges of the fins was neglected as the fin thickness was 0.008 to 0.009 in. and also the area of the fin collars at the tube attachment was not taken into account. Both these areas were very small.

The rate of heat transfer, q, was taken as q_w, obtained from the water side, as this should be the highest value if there were any transfer of heat other than to the flowing air. However, heat balances within the 5 percent allowance showed no particu-

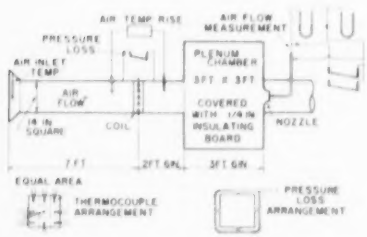

Fig. 2. Schematic arrangement of apparatus

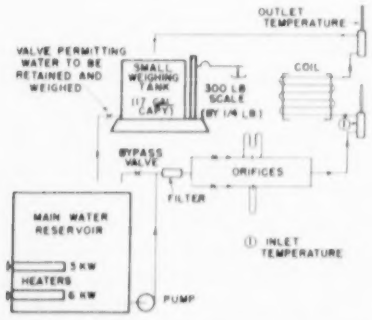

Fig. 3. Schematic arrangement of water circuit

Nomenclature

English Letter Symbols

A_a = total air-side surface area, square feet.
A_f = fin air-side surface area, square feet.
A_t = tube air-side surface area, square feet.
A_w = tube water-side surface area, square feet.
A_o = coil face area = coil width × height, square feet.
c = specific heat of water, Btu per (pound) (Fahrenheit degree).
d = tube outside diameter, inches.
d_i = tube inside diameter, inches.
G_o = m_a/A_o = air mass velocity based on A_o, pounds per (minute) (square foot of A_o).
h_a = combined air-side unit conductance, Btu per (hour) (square foot) (Fahrenheit degree).
h_w = water-side unit conductance, Btu per (hour) (square foot) (Fahrenheit degree).
k = thermal conductivity of water, Btu per (hour) (foot) (Fahrenheit degree).
m_a = air mass flow rate, pounds per minute.
m_w = water mass flow rate, pounds per second.
p = tube spacing or pitch, center-to-center, inches.
q = rate of heat transfer, Btu per minute.
q_o = rate of heat transfer for unit face area per degree temperature difference = $q/A_o\theta_m$, Btu per (hour) (square foot) (Fahrenheit degree).
Q = rate of heat transfer, Btu per hour.
R_o = overall unit resistance based on A_a, (hours) (square feet) (Fahrenheit degrees) per (Btu).
R_a = combined air side unit resistance based on A_a, (hours) (square feet) (Fahrenheit degrees) per (Btu).
R_t = tube wall unit resistance, (hours) (square feet) (Fahrenheit degrees) per (Btu).
R_w = water side unit resistance, (hours) (square feet) (Fahrenheit degrees) per (Btu).
t_a = air temperature, Fahrenheit.
t_w = water temperature, Fahrenheit.
U_o = overall unit conductance based on A_a, Btu per (hour) (square foot of A_a) (Fahrenheit degree).
V = air velocity, feet per minute.

Greek Letter Symbols

Δp_t = overall pressure loss across coil, inches water.
θ_a = temperature difference between total air side surface and air, Fahrenheit.
θ_w = temperature difference between water and tube wall, Fahrenheit.
θ_m = mean temperature difference defined by Equation 5, Fahrenheit.
μ = fluid absolute viscosity, consistent units.
ρ = fluid density, pounds per cubic foot.

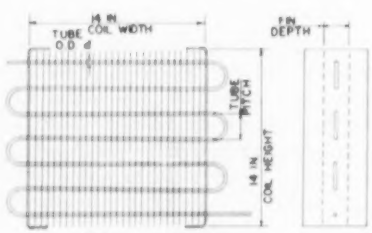

Fig. 4. Coil geometry

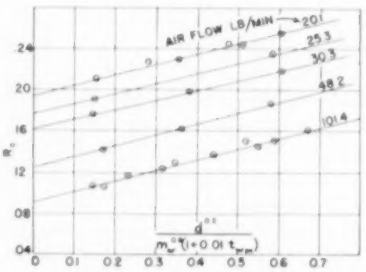

Fig. 5. Typical plot of overall resistance *vs* water side resistance factor

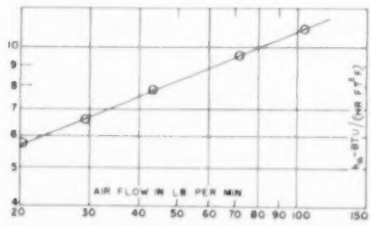

Fig. 6. Typical plot of overall air side unit conductance *vs* air flow rate

lar trend on either side of zero and thus q_w remains an arbitrary selection.

Calculation of the overall mean temperature difference (MTD), θ_m, was the subject of much consideration. The coil can be visualized as a single tube in cross flow. The initial results were plotted using (1) a log MTD, (2) an arithmetic MTD, and (3) a log MTD based on the mean water temperature and the air inlet and outlet temperatures. The last named gave the least scatter of points in plots of h_a against m_a and was used thereafter. Thus θ_m is defined as

$$\theta_m = [(t_{wm} - t_{a1}) - (t_{wm} - t_{a2})] / ln[(t_{wm} - t_{a1})/(t_{wm} - t_{a2})]$$

$$= \Delta t_a / ln\,[(t_{wm} - t_{a1})/(t_{wm} - t_{a2})] \quad (5)$$

Description of Apparatus

Fig. 2 shows schematically the arrangement of the test equipment. Air was sucked through the test section by a centrifugal fan. Following the test coil was an exit section with plenum and metering nozzle. Following the nozzle was a length of duct connecting to the suction side of the fan. Air flow was controlled by a slide valve at the fan discharge.

The 3 kw and 6 kw heaters, Fig. 3, were each capable of ¼ to ½ output. The 3 kw heater was connected electrically with a variable transformer so that the heat input was capable of fine control. The water was circulated by a centrifugal pump through metering orifices to the bottom of the test coil, returning thence to a small weighing tank. Both inlet and outlet pipes from the weighing tank were free. The water flow rate was controlled by a bypass at the discharge side of the pump.

The test coil and duct were insulated with approximately 1 in. thickness of hair felt for a distance of 1 ft either side of the coil.

Table 1. Description of the 38 Coils Tested

(All coils 14 x 14 in. overall, giving a face area of 1.361 sq ft)

Coil No.	TUBE		FIN				SURFACE AREA, SQ FT				
	O. D. in.	Pitch, in.	Depth, in.	Thickness, in.	No. per in.	Total No.	Tube inside A_w	Tube outside A_t	Fin A_f	Total A_a	
1	0.390	1.0	1.0	0.008	3	42	1.5	1.63	7.18	8.81	
2	0.390	1.0	1.0	0.008	5	72	1.5	1.60	12.33	13.93	
3	0.390	1.0	1.0	0.008	7	100	1.5	1.57	17.12	18.69	
4	0.390	1.0	1.0	0.008	9	128	1.5	1.55	21.9	23.45	
5	0.390	1.0	1.0	0.008	11	152	1.5	1.52	26.02	27.54	
6	0.390	1.0	..	..	0	..	1.5	1.67	..	1.67	
7	0.390	1.375	1.0	0.008	3	41	1.07	1.16	7.15	8.31	
8	0.390	1.375	1.0	0.008	7	99	1.07	1.12	17.27	18.39	
9	0.390	1.375	1.0	0.008	11	157	1.07	1.08	27.4	28.48	
10F	0.390	1.0	2.0	0.008	3	44	1.5	1.63	16.08	17.71	
11F	0.390	1.0	2.0	0.008	7	99	1.5	1.57	36.16	37.73	
12F	0.390	1.0	2.0	0.008	11	155	1.5	1.52	56.7	58.22	
10R	0.390	1.0	2.0	0.008	3	44	1.5	1.63	16.08	17.71	
11R	0.390	1.0	2.0	0.008	7	99	1.5	1.57	36.16	37.73	
12R	0.390	1.0	2.0	0.008	11	155	1.5	1.52	56.7	58.22	
13	0.390	1.0	2.0	0.009	3	41	1.5	1.63	14.99	16.62	
14	0.390	1.0	2.0	0.009	5	71	1.5	1.59	25.95	27.54	
15	0.390	1.0	2.0	0.009	7	99	1.5	1.56	36.2	37.76	
16	0.390	1.0	2.0	0.009	9	125	1.5	1.53	45.65	47.18	
17	0.390	1.0	2.0	0.009	11	155	1.5	1.50	56.7	58.2	
20	0.390	1.0	1.5	0.009	3	41	1.5	1.63	11.02	12.65	
21	0.390	1.0	1.5	0.009	7	99	1.5	1.56	26.6	28.16	
22	0.390	1.0	1.5	0.009	11	156	1.5	1.52	41.9	43.42	
28	0.522	0.875	1.0	0.009	3	41	1.30	1.54	7.23	8.77	
29	0.522	0.875	1.0	0.009	7	99	1.30	1.48	17.44	18.92	
30	0.522	0.875	1.0	0.009	11	157	1.30	1.42	27.66	29.08	
31	0.522	0.750	1.0	0.009	3	42	1.46	1.73	7.02	8.75	
32	0.522	0.750	1.0	0.009	7	101	1.46	1.66	16.89	18.35	
33	0.522	0.750	1.0	0.009	11	159	1.46	1.59	26.58	28.17	
34	0.390	2.0	1.0	0.009	11	157	0.75	0.75	28.68	29.43	
35	0.390	2.0	1.0	0.009	7	97	0.75	0.78	17.72	18.50	
36	0.390	2.0	1.0	0.009	3	41	0.75	0.81	7.49	8.30	
37	0.390	2.0	2.0	0.009	3	42	0.75	0.81	15.87	16.68	
38	0.390	2.0	2.0	0.009	7	98	0.75	0.77	37.0	37.77	
39	0.390	2.0	2.0	0.009	11	154	0.75	0.76	58.2	58.96	
40	0.390	1.0	1.0	0.009	3	41	1.5	1.63	7.02	8.65	
45	0.390	1.0	1.0	0.009	3	42	1.5	1.62	7.18	8.80	
46	0.390	1.0	1.0	0.011	3	42	1.5	1.61	7.18	8.79	

Instrumentation

The measured quantities were air and water flow rates, air and water inlet and outlet temperatures and pressure drop across the test coil. Details of instrumentation appear in Appendix B.

Description of Test Coils

A schematic drawing of a coil is shown in Fig. 4, together with nomenclature used. The method of manufacture was to blank out the fins with a small collar or flange around the tube hole and to insert the separated tubes, which were expanded into the collars by forcing an oversize ball through them. The 180 deg bends were brazed on to form a continuous water passage. The bond between fin and tube was then as close as possible without being homogeneous. Tubes were copper and fins were aluminum and under the conditions of use there was little opportunity for corrosion. A re-test of one coil after being in storage many months showed no detectable change in performance. Only occasionally was it found on inspection that a few fins were loose on the tubes and as these never exceeded 1 percent of the total number of fin-tube joints, it was concluded that the bonding was satisfactory in giving minimum thermal resistance next to a homogeneous joint.

In Table 1 is a list of the 38 coils tested. Test coils include some with fin depths of 1, 1½, and 2 in., tube pitches of ¾, ⅞, 1, 1⅜, and 2 in., and fins of 0, 3, 5, 7, 9, and 11 per in. All possible combinations of these arrangements were not tested. All coils were 14 in. square with a face area of 1.361 sq ft. All coils of the same width and nominal number of fins per inch did not have the same total number of fins due to manufacturing tolerances. The actual total number of fins was used in computing surface area. There is also a lack of true similarity in that the fin thickness of some coils was 0.008 in. as opposed to the majority which had a thickness of 0.009 in., again due to the manufacture of the coils being on a commercial rather than a laboratory basis. A comparison of three fin thicknesses on one particular arrangement was made directly and shown to be small.

The thick outside supports of the coils are not included in the surface area in Table 1 as they normally amounted to only a fraction of the total surface area. However, the effect was tested in the case of one coil having the lowest total fin and tube

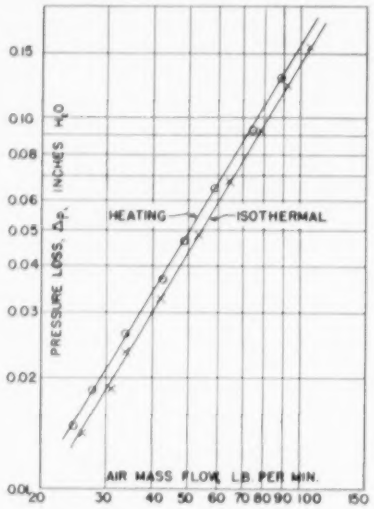

Fig. 8. Pressure loss *vs* air flow rate — typical plots of isothermal and heating runs

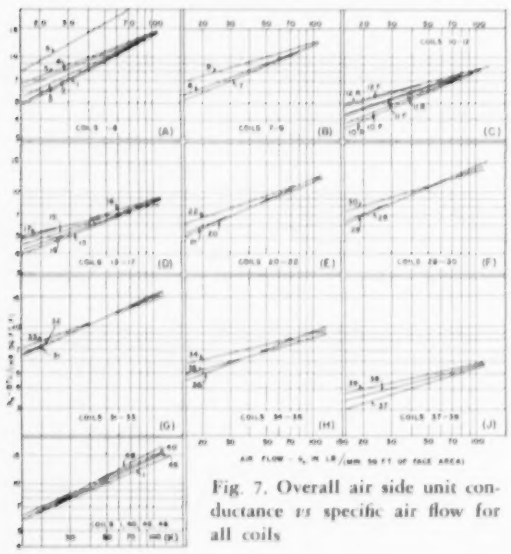

Fig. 7. Overall air side unit conductance *vs* specific air flow for all coils

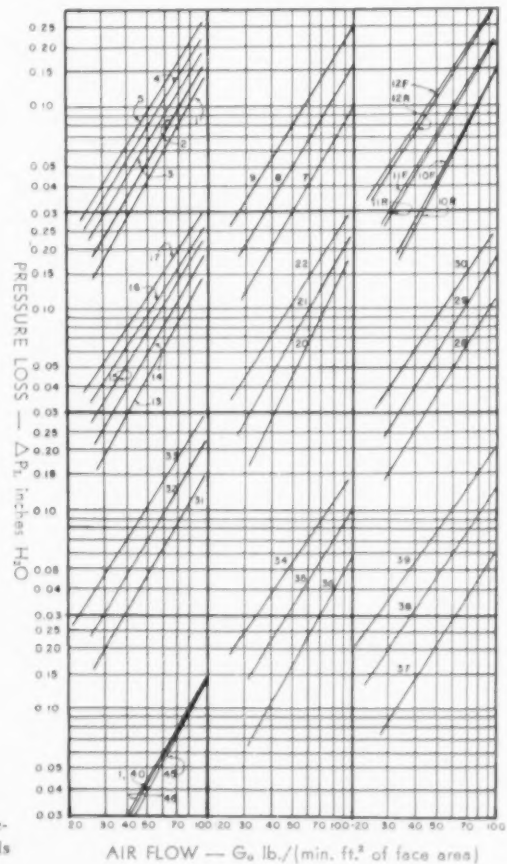

Fig. 9. Pressure loss *vs* specific air flow rate for all coils

area, by performing tests with and without the side walls insulated with 1/8 in. corkboard. The effect on R_o was not detectable within the usual limits of scatter and as this was an extreme case, no account was taken of this area in computations.

Presentation of Data

The number of separate tests in this phase of the investigation was of the order of 1000 and it is not possible to present here either the tabulated data or even each separate plot for a given coil.

From plots similar to Fig. 5, the h_a value was found as the reciprocal of the intercept of the extrapolated line on the R_o axis. These values of h_a were then plotted against the air mass flow m_a on logarithmic paper, resulting in plots of which Fig. 6 is typical.

These h_a *vs* m_a lines were then used to plot h_a against G_o, where $G_o = m_a/A_o = \rho_a V_o$, the specific mass flow in lb per (minute) (square foot of face area). Since all the coils had the same value of A_o in this instance, the replot is only a shift of the abscissa,

but G_o is more basic than particular values of m_a. It might be noted that since $A_o = 1.361$ sq ft and the average ambient density was about 0.0735, then $V \approx 10\ m_a$, where V_o is the face velocity in feet per minute. Thus a value of m_a of 50 lb per min represents a velocity of about 500 fpm.

The h_a *vs* G_o results are shown in Fig. 7, each diagram (A) to (J) being for a group of similar geometry except for fin spacing, while (K) shows the effect of fin thickness on one particular fixed arrangement having 3 fins per in. The lines are shown without experimental points for clarity.

Pressure Loss

The pressure loss Δp_L was measured for all coils under isothermal conditions and for many coils during heating runs. A typical plot of Δp_L

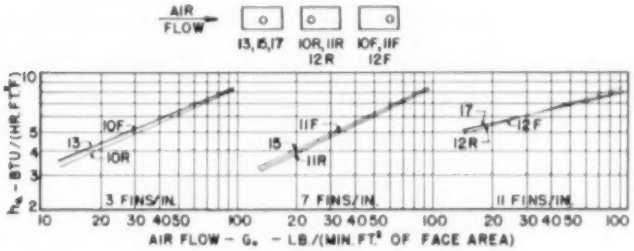

Fig. 10. Comparisons of unit conductance for symmetric and eccentric fins

The following maximum ranges of test variables indicate the scope (exclusive of bare tube tests):

Water inlet temperature	t_{w1}	140	— 178.2 F
Water outlet temperature	t_{w2}	101.3	— 169.8 F
Water temperature drop	Δ_{tw}	3.5	— 69.6 F
Air inlet temperature	t_{a1}	67.2	— 90 F
Air outlet temperature	t_{a2}	73.65	— 127.4 F
Air temperature rise	Δ_{ta}	3.05	— 49.4 F
Mean temperature difference	θ_m	29.4	— 90.6 F
Overall rate of heat transfer	q	40.4	— 381 Btu per min

Heat Transfer

Fig. 5 shows a typical plot of R_o against the factor proportional to R_w. The bottom line of highest air flow shows the distribution of points obtained when a large number of values of R_w was taken to check the slope. The remaining air flows had fewer points, except the top line for lowest air flow in which additional points were taken, as the line of fixed slope through the first two points taken showed scatter with the third point. The line for 25.3 lb per sec air flow shows only two points and was taken for confirmation to make an extra point on the graph of h_a against m_a.

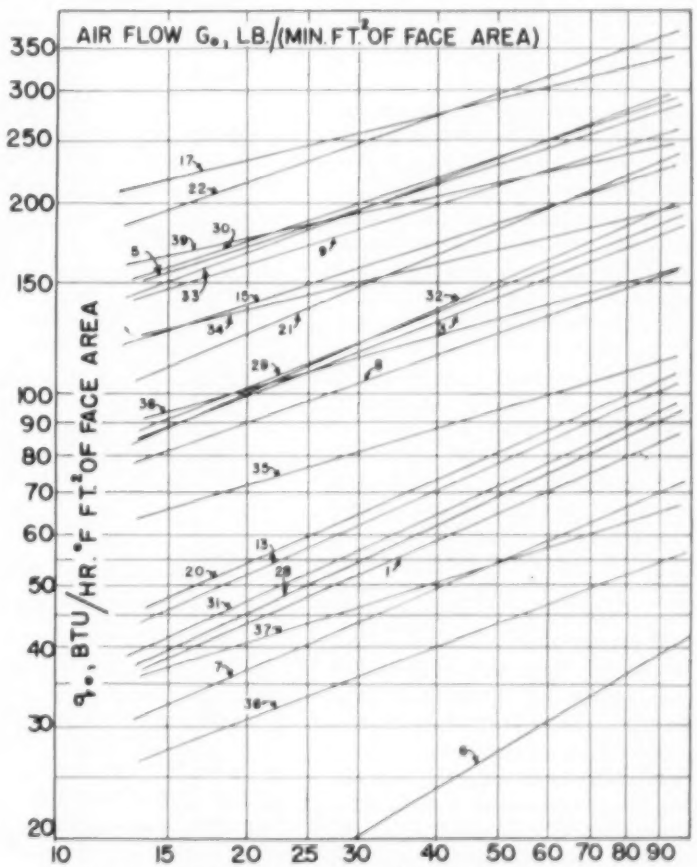

Fig. 11. Comparison of overall rate of heat transfer for all coils

showing a comparison under heating and isothermal conditions is given in Fig. 8. It was found that the two could be correlated satisfactorily by using the density evaluated at the mean air film temperature, taken as the arithmetic mean of absolute air and water bulk temperatures, that is

$$\Delta p_L \text{ (heating)}/\Delta p_L \text{ (isothermal)} = [t_{a1} + t_{a2} + t_{w1} + t_{w2} + 4(460)]/[4(t_{a1} + 460)] \quad (6)$$

Values of Δp_L isothermal plotted against G_o are shown in Fig. 9. Within the limits of scatter, which were very small, the lines are linear with the exception of a few for coils of small fin spacing where there is an upward trend at low flow rates. This trend is similar to that for the air side coefficient of heat transfer. However, as the effect was very small in the range of common flow rates, the plots have all been taken as linear.

Discussion of Results

From Fig. 7 it is seen that at low velocities, the combined air side conductance h_o is higher for the coils of small fin spacing and that as the air flow increases the lines tend to converge and sometimes cross over.

Fig. 7 (K) shows the effect of fin thickness on heat transfer. All coils were of 3 fins per in. and of the same geometrical arrangement, but No. 1 had a fin thickness of 0.008 in., Nos. 40 and 45 of 0.009 in. and No. 46 of 0.011 in. Coils 40 and 45 were nominally similar and are included to demonstrate the possible effect of departure from uniform conditions, because approximately 1/3 of the fins of coil 40 were bent in transit and were hand-straightened. The latter resulted in some large scale *waviness* and lack of parallelism of some vanes. The relatively similar performance of coils 40 and 45 demonstrates, in this instance at least, that coils of this type are not very sensitive to small departures from nominal conditions.

Fig. 10 shows the performance of coils similar in all respects except the position of the tube in the fin. Coils 13 to 17 were of the usual type with the tube symmetrically placed in the center of the 2-in. deep fin, while coils 10F to 12F had the tube ½ in. off center displaced towards the rear and coils 10R and 12R had the tube displaced ½ in. towards the leading edge. It was thought that as the heat transfer coefficient from a tube in cross flow varies around the circumference, the altered temperature distribution in the fin, together with the altered air flow pattern, would result in a difference of combined conductance. However, Fig. 10 shows that the difference was slight and that, within the general limits of manufacturing and experimental tolerance, the eccentricity of the tube with respect to the fins exerts no discernible effect. Coils 10F to 12F and 10R to 12R are therefore not included in any subsequent analysis.

Attention is drawn to some inconsistent results. In particular the slopes of the R_o lines for 3 groups of coils in plots similar to Fig. 5 did not conform to the values predicted on the area ratio basis. Thus coils 31 to 33 yield a slope about 35 percent greater than the theoretical coils, 34 to 36 about 10 percent less and coils 37 to 39 about 20 percent less. The experi-

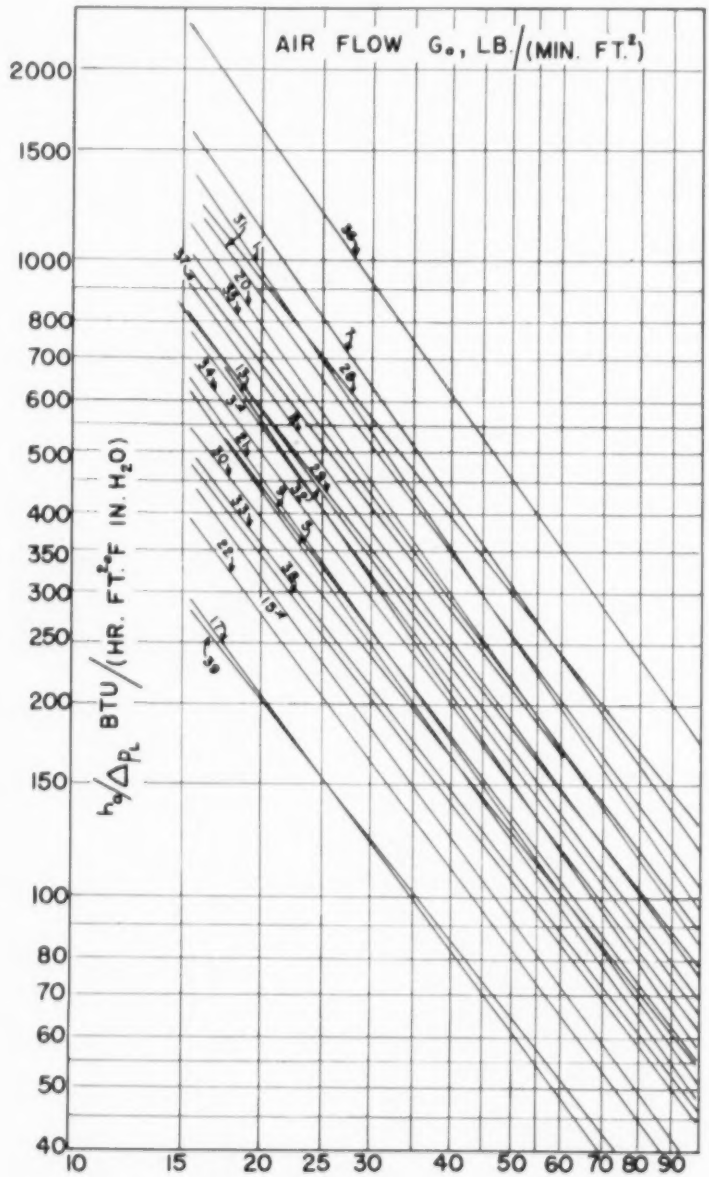

Fig. 12. Comparison of unit conductance per pressure loss for all coils

mental points gave consistent linear plots and obviously could not be forced into the nominal slope. In each group of three coils, the coils were consistent among themselves in following the area ratio requirement. One coil of each group was checked and rechecked, the re-tests involving reinstallation and collection of data by different operators. Observational and dimensional inspection showed no apparent differences in construction. The performance was therefore taken as representative, although it is regrettable that no constructional, installational, experimental, or theoretical hypotheses can be put forward to account for the apparently anomalous results.

Practical performance criteria are likely to be concerned, not with heat transfer coefficient alone, but with the overall rate of transfer per unit temperature difference and with the associated power loss due to pressure drop. Figs. 11, 12, and 13 show some of these overall performance criteria.

Fig. 11 shows q_o, the rate of heat transfer, Btu per (hour) (Fahrenheit degree) (square foot of face area), that is

$$q_o = (h_a A_a)/A_o = (h_a A_a)/1.361 \quad (7)$$

The highest values of q_o are for the coils having the most fins per inch, but an important conclusion from these results is that although there is an increase in q_o for increase in fin depth from 1 to 1½ in. (coils 1 and 20, 3 and 21, 5 and 22), there is little or no increase in going from 1½ to 2 in. (coils 20 and 13, 21 and 15, 22 and 17). The effect of tube spacing by itself is approximately proportional to that for film coefficient alone, as the surface area contributed by the tubes is small compared to the surface area of the fins.

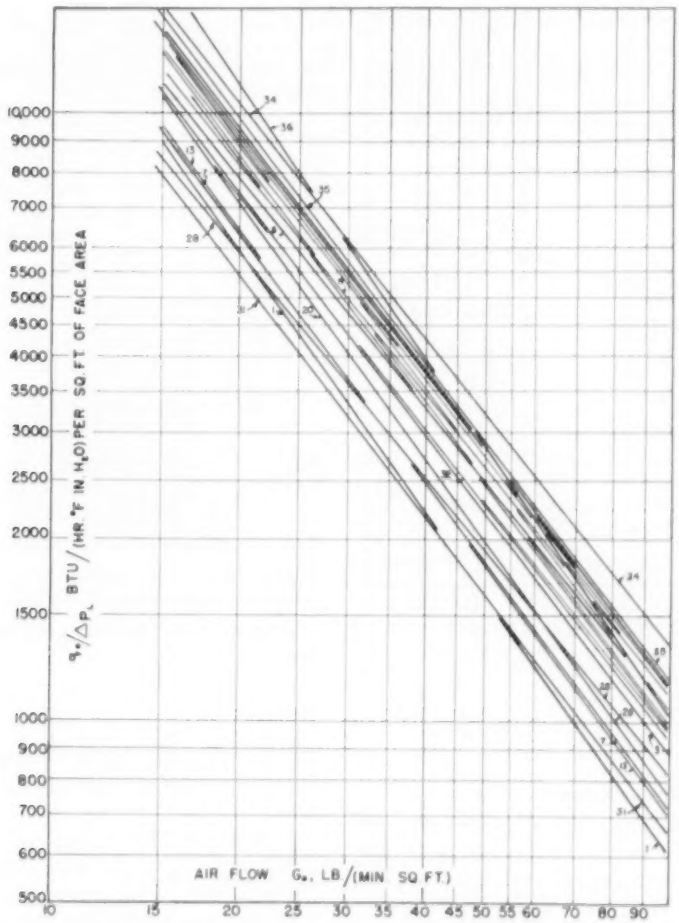

Fig. 13. Comparison of rate of heat transfer per pressure loss for all coils

Fig. 12 shows the ratio of the combined air side coefficient to the pressure loss, $h_a/\Delta p_L$. The coils of best performance with this criterion are those of wide fin spacing, wide tube spacing and shallow fins, the highest values being for coil No. 36 with one inch deep fins on 2-in. center, 3 fins per in. Any of the three methods of increasing the rate of heat transfer, number of fins, depth of fins, or number of tubes occurs only with proportionately greater increase of pressure loss. A better $h_a/\Delta p_L$ value is obtained by doubling the number of tubes rather than by doubling the fin depth and has approximately the same effect as doubling the number of fins.

Fig. 13 gives the ratio of rate of heat transfer per unit face area and unit temperature difference to pressure loss, $q_o/\Delta p_L$, which is perhaps the most significant design parameter if neither heat transfer nor pressure loss are by themselves limiting criteria. It will be seen that all coils now lie within a much narrower range than for either of the other two criteria, although this range is still about two to one. The best performance on this basis is achieved by coils of closely spaced fins of small depth on wide tube spacing. Many of the coils have such a similar performance that they may be represented by one line.

The effects of fin spacing, fin depth and tube pitch alone are shown in Figs. 14, 15, and 16. Fig. 14 shows h_a, $h_a/\Delta p_L$, q_o, and $q_o/\Delta p_L$ plotted against the number of fins per inch for a constant air mass velocity, G_o, of 50 lb per (min) (sq ft) for coils 1-6 having a tube diameter of 0.390 in. with one inch spacing, coils 1 to 5 having 3, 5, 7, 9, and 11 fins per in., respectively, and coil 6 being bare. At this value of air flow (approx. 680 fpm), the effect of fin spacing on h_a is very small, but q_o still increases continuously with the number of fins, and the maximum rate of heat transfer has not been reached with 11 fins per in., the largest number tested. However, the ratio of heat transfer to pressure loss, $q_o/\Delta p_L$, apparently

reaches a maximum at about 7 fins per in., with little change thereafter.

Fig. 15 shows the various criteria plotted against the ratio of tube pitch to tube diameter for coils of one inch fin depth, 7 fins per inch, for G_o = 50 lb per (min) (sq ft). Three of these coils, 3, 8, and 35, had a tube diameter of 0.390 in. and the other two (29 and 32) a tube diameter of 0.322 in. Within this small range of tube diameter, the pitch/diameter value appears a correlating parameter, with no effect due to actual tube diameter by itself. It is seen that increasing the pitch ratio reduces the values of heat transfer but increases the heat-transfer to pressure-loss ratios.

Fig. 16 shows the various criteria plotted against fin depth for coils of 0.390-inch tube diameter 1 in. pitch, 7 fins per in., for G_o = 50 lb per (min) (sq ft) together with the values for the bare tube coils, Nos. 3, 21, 15, and 6. This demonstrates clearly the decreasing value of fin depth above 1½ in.

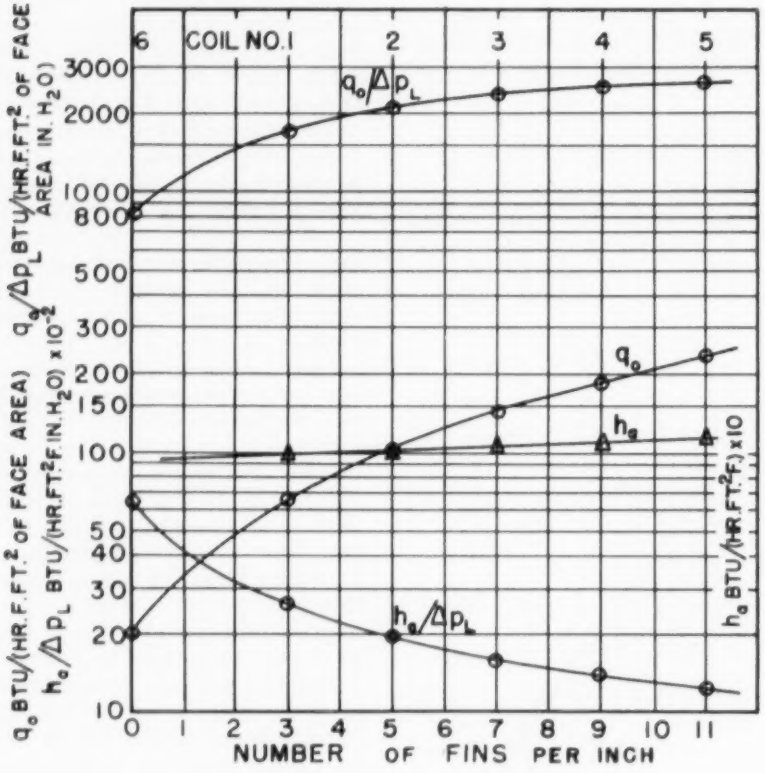

Fig. 14. Effect of fin spacing on coil performance

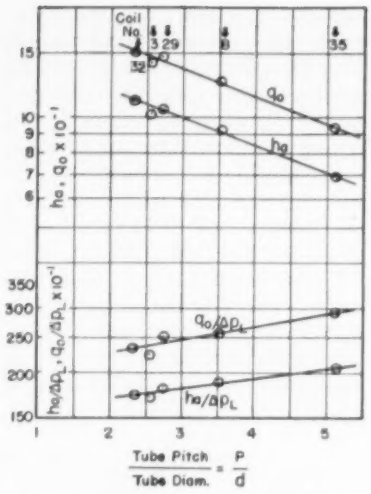

Fig. 15. Effect of tube pitch-tube diameter ratio on coil performance

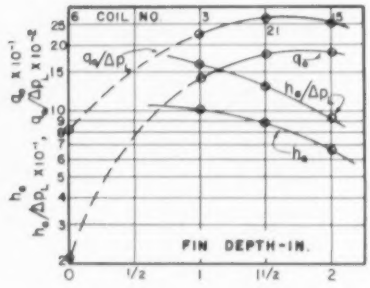

Fig. 16. Effect of fin depth on coil performance

Acknowledgment

The experimental results were obtained in a research project at Cornell University generously sponsored by The Salvatore Giordano Foundation, Inc., of Maspeth, New York. The author is indebted to members of the staff of the Department of Thermal Engineering for suggestions and criticisms and to several students who helped in obtaining the experimental data.

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Abstracts . . . from a Symposium on

High-Velocity Air Distribution

P. B. Gordon, Moderator

Vice President, Wolff & Munier, Inc., New York, N. Y.

A symposium session on High-Velocity Air Distribution was held during the 62nd Annual Meeting of ASHAE at Cincinnati on January 25, 1956, at which five prominent authorities presented their views concerning various assigned topics of current interest.

What follows here is an abstract of their prepared papers condensed, paraphrased, and edited to meet available space. The papers in full with illustrations, tables, and examples are to be made available as a separate Bulletin. For details of method of obtaining it see page 150.

I – Duct Design

C. MILTON WILSON — General Sales Manager, Anemostat Corporation of America, New York, N. Y. A.B., B.S. in mechanical engineering, M.E. Columbia University, New York, N. Y. Licensed professional engineer, and a member of ASHAE.

It is not correct to state that a particular duct sizing method is the best that can be evolved. It can be stated that duct design methods, which are reasonable for low velocity systems, cannot be used without revision or adaptation for high-velocity duct design. This discussion refers only to systems where attenuating devices are used at all outlets.

Component Characteristics

It is important to review quickly the flow and basic sound characteristics of the four chief components and sections of an air distribution system.

1. *The Valve-Attenuator-Diffuser Combination*: This unit is the least understood but most critical part of the system. There are as many types of valves as there are diffuser manufacturers. All are ingenious in design and pinch out the static pressure by some velocity conversion with minimum static regain. Their object is to reduce the static pressure with minimum noise regeneration to keep the size of the associated attenuator to a minimum.

It is important to know their sound levels as affected by capacity and imposed pressures and the minimum static pressure, which is the static pressure needed at the unit intake to force through it a specific quantity of air, when the valve is in the wide open position.

2. *The End Section of the System*: Since fan hp is determined by the net duct losses plus the minimum static pressure of the valve-attenuator combination, the selection at the end section is extremely important. For example an arbitrary selection of a unit of 350 cfm may show a minimum static pressure of 0.65 in. However, if the selection tables are studied it will be found that the next size attenuator diffuser combination for the same capacity requires only 0.2 in. sp, which reduces the fan static a very important 0.45 in. This observation applies not only to the very last valve-attenuator on the line; it applies to a group of units on the end section until the duct friction has been built up to justify the use of units with high minimum static pressures without penalizing the fan.

3. *Pressure - Sound - Characteristics of Standard Valve-Attenuator Combinations*: Another characteristic of these units, important to the designer, is the change in sound level at constant capacity with variable pressure. Variations as high as 10 decibels may be encountered when the pressure is increased from minimum static to 3 in. Sound level variation is eliminated by proper equipment selection, but it is important to keep the sound level down.

4. *Takeoffs and Transitions*: To design an economical system the engineer must streamline the main distribution duct to the limit. The designer should study the possibility of using small branch ducts and high velocity so that both velocity and static, or the total pressure, is reduced to take a pressure load off the attenuator diffuser units.

It can be concluded from the usual design data on losses at elbows and fittings that near the fan it may be advantageous to use right angle takeoffs to lose pressure, but near the end of the system acute angle takeoffs may be more logical.

It is important to design carefully when ducts leave plenums. For example, if air is transferred from a plenum at 500 fpm to 4000 fpm in the main duct, a simple takeoff means a loss of 0.47 in.; a 30 deg takeoff, 0.25 in.; and the bell mouth, 0.10 in. Thus streamlining can save almost 0.4 in. pressure.

Temperature Differential

Although the foregoing discussion has referred only to pressure, velocity and sound problems, it is extremely important for the engineer to realign his thinking as regards temperature differential. Ducts are reduced in size not only by increased velocities but by increased temperature differentials. There has been a

very positive trend towards the use of higher temperature differentials.

Duct Design Procedures

Although some other methods have been evolved, most of the systems now in use have been designed using a combination of the equal friction, static regain and total friction methods. As with all systems some practical assumptions must be made and adjusted to the particular design problem.

Having established the air quantities and made a single line layout to establish lengths and turns, the designer uses the equal friction method to size the main duct with a starting velocity of about 4000 fpm. Using the friction chart, he intercepts the 4000 fpm mark. If the intercept is to the right of the 1 in. per 100-ft mark, he reduces velocity and gets on this line as quickly as possible. When quantities exceed 8000 cfm, he sizes at constant velocity until the 1 in. per 100-ft line is reached and then follows this line with resultant velocity decreases. It can be noted from the friction chart that when the capacity is 500 cfm, which suggests that the last 2 diffusers have been reached, the velocity has dropped to 2000 fpm.

The friction chart values multiplied by the equivalent lengths of ducts give the friction in the main duct to which must be added the highest minimum pressure of the attenuators near the end of the main line and any other direct losses such as plenum or sound trap losses.

From this value deduct the static regain in accordance with the standard formula. In the average system this amounts to about 0.4 in. Be sure that minimum velocity used is not less than the velocity required at the inlets to the last valve attenuators on the line.

The last step does not affect the fan hp, but it does save money on ducts and valve attenuators. Determine the pressure in the main duct at the main branch intercepts. Then, knowing the minimum pressure required at the last attenuator at the branch, the difference should be used up with small ducts at high velocity and 90 deg takeoffs to lose the velocity pressure.

II – Duct Construction

The mechanical contractor is interested in high-pressure and medium-pressure systems for the following reasons: (1) They may be a means of maintaining minimum installed prices. (2) These systems may assist in the reducation of overall costs; perhaps through less insulation, less cutting and less patching and furring. (3) They can make possible greater ease of installation and fewer conflicts with other trades. (4) They produce a feeling of satisfaction in challenging the contractor to put out his best effort.

Keeping these points in mind and taking into account also the necessity of avoiding overly costly methods, our firm on some recent installations undertook some departures from tried and true methods. The result was some explorations into two categories,

K. A. J. MONIER — President, A. J. Monier & Co., Inc., Mechanical Contractors, San Antonio, Tex., in charge of general operation since 1938 except for commissioned service with Corps of Engineers from 1941-46 and from 1950-52, rank Lt. Col.; B.S. degree in M.E. from A. & M. College of Texas. Member ASHAE, registered professional engineer, Texas.

viz: (1) The use of new methods and techniques in the shop and in the field, and (2) The use of varied means of sealing and taping. It has been possible only to scratch the surface thus far, but at least this has been done. As a result, attention is called to some techniques which have proven support of a practical nature.

One of these procedures is the use of a standard lockformer followed by an electric stationary grooving machine to tightly fold the sheet metal to form a finished Pittsburgh lock. It has been possible to hold test pressures up to 20 in. of water on such ducts without applying any additional sealant to the groove before folding. This method is useful on either round or rectangular ducts of practically all the sizes and gages usually encountered.

Another of these procedures is the use of swaging rolls to form the lateral joints in round ducts. It is necessary to clip the part of the Pittsburgh seam on the male section and to spot emboss in order to allow taping without the use of sealants. By this method and the use of spot welders or tack welding, prefabricated sections up to 25 ft long can be made up without fear of damage prior to installation.

To make the swaged joints tight, 2 layers of tape are applied — one is a layer 1 in. wide, and the other is a reinforcing layer 2 in. wide over the initial tape. Numerous types of tape were experimented with, but the most satisfactory for this situation seemed to be an aluminum tape of high adhesive qualities that had a malleable characteristic which permitted it to conform to the uneven nature of the joint, there being one thickness of metal difference in section elevation. The tape was worked into the voids by means of soft wood paddle sticks and smoothed onto a clean surface. By this method, test pressures of 20 in. of water were satisfactorily held without the use of any additional adhesives. Pliable elastic adhesive tapes were found not to adhere tightly enough over voids, particularly at the Pittsburgh seams, to prevent leakage at the high test pressures unless additional sealants were applied.

Actually, it is felt that the cost of labor and material is in favor of the use of tapes rather than sealants, plus the added advantages of a cleaner, and possibly a more durable, job.

Some unsuccessful experiments were made to work out a method whereby a cantilevered pipe section about 15 ft long made of extra-heavy pipe could be used to suitably position the bottom lead of a spot welder so that spot-welded joints could be made on sections of duct up to 30 ft long. While the particular experiments tried were not successful, it is believed that methods can be worked out which will permit this type of operation.

As matters now stand, an engineer is faced with a variety of frequently conflicting recommendations on a great many of the duct construction details encountered when high-velocity distribution is used. For example, one manufacturer may call for the use of take-offs on a lateral from the line of flow while others recommend take-offs welded in square with the principal duct.

Other conflicting ideas exist concerning the use of all welded construction with clamped joints between ducts and flexible connections as against the use of sealants and tapes for the same purpose. Some people advise the installation of dampers in round high-pressure ducts while others advise against it. There is little agreement concerning the type of flexible tubing, gages of metals, restrictions on use of flexible in elbows, proper construction of elbows, the use of metal screws, types of sound absorbers, and isolation of hangers. All of these create confusion.

It is felt that frequently the result of all this is that the contractor is handed a specification containing most rigid requirements and that this situation results in high costs to the owner.

It is believed that some coordinated effort on the part of the Society could be undertaken in which all phases of the industry might participate, and which could bring together the most valuable information accumulated through their several experiences. From such an accumulation, it is believed that a minimum satisfactory design criterion could be established and that this information could be disseminated through the membership. Practical specifications on all methods and procedures as well as materials could be offered without the application of safety measures in the chain of command and there would not be the extreme variations of requirements set up by different engineers for the same type of installation.

Such a situation should help to establish the rightful position of the mechanical equipment as the leading influence in present-day building construction. It should promote the proper slogan of today's effort — *As goes the mechanical — so goes the entire job.* It should help keep pace with other industries in constant streamlining, modernizing and development of money-saving procedures.

Journal Section

III – Economics, Cost vs. Velocity

JOHN EVERETTS, JR. — Consulting Engineer with Charles S. Leopold, Philadelphia, Pa. Professor of mechanical engineering, Columbia University, New York, N. Y. M.E., Brooklyn Polytechnic Institute, 1929. Currently vice chairman ASHAE Committee on Research. Active on many other ASHAE committees, contributor to THE GUIDE and *ASRE Data Book*.

The relation between cost and velocity of high-velocity air systems is one of the most controversial subjects today. In preparing this paper many people were interviewed, both personally and by correspondence, with particular reference to the components of a high-velocity system.

After a preliminary analysis, it was decided, for comparative purposes, to start out with a low-velocity low-pressure system as a base and then to extend the pressure and velocity to the limits available for a Class I, Class II and Class III fan.

The low-pressure system was based on the data in Table 1.

Table 1—Data for Low-Pressure System

Inlet static to fan	2.00 in. wg
Terminal pressure at last outlet	0.20
Duct resistance	0.10 in. /100 ft
Static regain	0.10
Velocity pressure increase	Nil

With an equivalent length of duct of 400 ft the system static would be:
2.00 + 0.20 + 0.40 − 0.10 = 2.50 in. wg

The upper limit of a Class I fan is 3.75 in. wg total pressure, which is still considered within the low-pressure system range; therefore, a terminal pressure of 0.20 in. was also used in this case. For the Class II fan with a maximum total pressure of 6.75 in. wg and the Class III fan with a maximum of 9.75 in. wg, a terminal pressure of 1.00 in. wg was used for a typical ceiling outlet, with a sound attenuating box or high-pressure induction unit.

The duct systems selected for this study are: (*a*) a four-story large area building and (*b*) a twelve-story small floor area building. The supply ducts and air quantities in each building are identical for purposes of comparison. The supply ducts are 400 ft equivalent length to the farthest outlet. There are a total of 8 duct systems for each building. Comparisons are given using a total of 8 fans, each having a capacity of 44,000 cfm as against 2 fans each having a capacity of 176,000 cfm. As this air quantity is predicted upon an 18 deg TD between room temperature and delivered temperature, a further comparison was made based upon a 30 deg TD which reduced the air quantity to 26,500 cfm and 105,000 cfm, respectively.

Table 2—Identification of Four Basic Systems

		Total Pressure, in. wg
Case 1	Low pressure system	2.70
Case 2	Class I fan system	3.75
Case 3	Class II fan system	6.75
Case 4	Class III fan system	9.75

The four basic systems are identified in Table 2.

In all calculations, the full velocity pressure gain due to the increase in velocity in the duct over the outlet velocity of the fan was charged against the system and one-half the static pressure regain effected by the reduction in velocity through the supply duct was credited to the system. For Case 2, the pressure loss per 100 ft of duct was found to be 0.30 in; for Case 3, 0.75 in.; and for Case 4, 1.50 in.

The sizing of the supply duct for each case was based upon the calculated pressure drop per 100 ft.

Similar calculations for each case for both 18 and 30 deg TD permitted an estimate of the total square feet of surface of the supply ducts for all 8 systems being studied.

The total weight of sheet metal for each case under study was calculated based on ASHAE standard gages as shown in THE GUIDE.

The selection of the fans, motors, starters, and drives was based upon standard commercial practice. The motors are standard squirrel cage type with reduced voltage starters. Drives are standard V-belt type.

It should be noted that as the fan outlet velocity increased from approximately 1800 fpm in Case 1 to approximately 5000 fpm in Case 4, the bhp of the fans increases approximately 4:1. This not only requires increased electric wiring and incoming service, but also imposes additional refrigeration to absorb the temperature rise of the air through the fans. Instead of increasing the total cfm to compensate for the temperature rise through the fan, the system may be designed with a cooling coil after the fan discharge to reduce the air temperature to the design point.

It is sufficient for present purposes to point out that for Cases 2, 3, and 4 some form of sound absorption must be provided inside the ducts, at least up to the last elbow. This will increase the size of the ducts and will add approximately 4.5 percent to the weight. It will not increase the insulation cost as the sound absorbent material may also act as a thermal insulation. If a formal sound trap is installed which would be required for Cases 3 and 4, then the cost of this must be added to the system cost as thermal insulation must be included as part of the original design. It depends upon the type of sound traps used whether they will be more or less than the cost of the 4.5 percent increase in duct weight.

The saving in space of a high-velocity system is a question which can arouse endless argument. It should be noted that reductions in volume apply only to new construction. Existing buildings cannot take credit for this advantage and may be forced to a high-velocity system because of space limitations.

Investment costs of a high-velocity system will vary with the fans, motors, starters, drives, outlets, sheet metal ducts, and electrical wiring. The cost comparison for the electrical work includes 100 ft of run to the motors and a circuit breaker at the board. No new service is included.

Table 3 shows the calculated owning and operating costs based upon the following:

1. Equipment and material costs shown in Table 3 and cost of sound absorption, all of which have been amortized over a 15-year period at 5 percent interest.
2. The increase in operating cost of the refrigeration equipment based upon the increase in load for energy only. No demand charge has been included.
3. Maintenance costs have not been included.

Data from Table 3 have been plotted to indicate the trend of the annual owning and operating costs with increase in pressure and velocity of the system. It is possible also to plot† data from this study to permit corrections of base figures to give effect to heavier sheet metal gages and to changes in the TD of the air in the system.

Moderator P. B. Gordon, New York, N. Y., with members of the High-Velocity Air Distribution Symposium. (L. to R.) C. Milton Wilson, New York, N. Y.; John Everetts, Jr., Philadelphia, Pa.; D. B. Callaway, Beverly Hills, Calif.; K. A. J. Monier, San Antonio, Tex.; and W. L. Bachelor, New Britain, Conn.

Table 3—Calculated Owning and Operating Costs

Item		Case 1	Case 2	Case 3	Case 4
18° TD (8 Fans)					
Annual owning cost of supply side equipment		$ 11,100	$ 9,400	$ 16,500	$ 17,800
Operating cost supply side equipment		7,800	9,880	18,250	30,450
Increase in refrigeration operating cost		180	233	415	720
Annual cost balance of system		96,000	96,000	96,000	96,000
Operating cost balance of system		18,900	18,900	18,900	18,900
Total annual owning and operating costs		$133,980	$134,413	$150,065	$163,870
18° TD (2 Fans)	Total	$136,700	$136,013	$151,315	$162,460
30° (8 Fans)	Total	$128,150	$127,313	$139,865	$146,370
30° TD (2 Fans)	Total	$128,660	$128,873	$139,335	$146,820

†*Editor's Note:* Curves showing the data so plotted, various tabulations, and the application of this information to 2 examples is omitted from this abstract but is included in the Bulletin to be issued covering this symposium.

Examples worked out applying the data to buildings yield interesting results and show that the method can be applied advantageously.

The many variables involved in making such a cost evaluation prohibit any categoric statement that a high-velocity system is more or less economical than a low-velocity system. Each problem must be analyzed separately and on its own merits.

IV – Field Testing*

R. D. TUTT — Chief Engineer, Tuttle & Bailey, Inc., New Britain, Conn. Also, Sales Manager, Air Distribution Devices, Tuttle & Bailey, Inc. 1941-46 Supervisor, heating and ventilating, Allison Division, General Motors Corp. Author *Principles of Air Distribution*. Member ASHAE, served on TAC on Air Distribution. Chairman Engineering Committee, *Convector Manufacturers Association*.

Field Testing: A high-velocity distribution system requires a step by step procedure to check (*a*) duct tightness, (*b*) primary fan and duct capacity pressure and velocity measurements, (*c*) a sequence of distribution unit adjustments and measurements, and (*d*) the application and adjustment of duct pressure controls and supplemental unit adjustments.

The procedure for field testing discussed here is confined to a representative single fan, single-and double-duct design.

Duct Tightness: A visual inspection of the duct work is certainly not sufficient to determine whether leaks exist. A test equipment is necessary and consists of a pressure blower of sufficient capacity, a calibrated orifice to measure leakage volume, and a *U* manometer to measure the test static pressure developed. Normally, 6 in. of pressure is sufficient to determine tightness.

Testing should start before ductwork is enclosed and before any terminal units are installed. Generally, partial sections are tested separately so that leaks can be more easily located and corrected. All unit connections and openings are temporarily capped and the test rig is connected to the section to be tested.

Fan and Duct Capacity Check: A primary duct balance must be established at a static flow condition with maximum air sp flow through one duct. In a double-duct system, generally a cold air duct is fully loaded for the check and the heating duct is closed off.

Outside air dampers are set to minimum position; return air dampers set for maximum flow.

All controls for performing the following operations are locked out: duct pressure, fan speed, fan inlet or discharge dampers, temperature re-setting. All normally open and normally closed duct dampers are locked in their normal position.

Individual dampers in high-velocity units are full open on units on the longest equivalent duct run. Dampers on such units closer to the fan are pre-set in a partially closed position. Direction of foregoing rotation is visually checked and fan and motor speed measured with a rpm counter. Motor sheaves are adjusted to produce design fan speed. Motor hp consumption is checked against design load with a clamp-on ammeter, thus checking the load.

Total fan static pressure is measured with a pitot tube and manometer at the fan outlet to indicate positive fan discharge pressure and at the inlet to indicate the negative suction pressure. These readings are referenced against atmospheric pressure requiring that the open leg of the manometer be exposed to a non-pressurized space. The mathematical sum of these values will be the total static developed.

The design static pressure anticipated should match the measured values fairly closely to indicate that the duct construction and installation are reasonable. Total fan volume with the speed, hp, and pressure readings known, can be determined by reference to the manufacturer's fan performance curve.

A duct traverse with pitot-tube and inclined manometer affords the most accurate volume flow measurement and should be made in a straight section of ductwork where velocity flow contours are sufficiently even to produce a representative traverse.

Adjustment of Distribution Units: Volume flow for individual ceiling diffusers is generally measured by an instrument scaled in fpm and multiplied by the air outlet effective area flow factor. Other air distributing devices are tested for flow with a pressure sensing manometer or dial gage. The instrument readings can be related to primary volume from the manufacturer's basic data curve.

Volume is adjusted by opening or closing the inlet damper, usually accessible near the air outlet of the units.

High-velocity distribution units on the longest duct runs are checked to insure an adequate minimum fan pressure to create design flow. Individual units located near the midpoint of the distribution system are tested after these initial checks have been made. Discharge air velocities are mechanically adjusted to conform to the design air volumes required. After this initial balance, units located at the midpoint and on the longest run should be retested. An air balance within ± 10 percent of design, and often less, can be obtained by these methods.

Application and Adjustment of Duct Controls: In a double-duct system, the air volume flowing in one duct may vary as the load changes. As

*Mr. Tutt was unable to attend the Symposium. The material abstracted here is that presented by W. L. Batchelor, assistant chief engineer, Tuttle & Bailey, Inc., New Britain, Conn. Junior Member ASHAE.

the volume of air decreases the duct frictional loss decreases, so that it is possible to have available the fan discharge pressure in one duct as the volume flow in that duct decreases to zero.

Good room air distribution in the occupied area requires a fairly constant rate of primary air delivered throughout all phases of damper modulation. High-velocity distribution units are so arranged that the static pressure at the inlet depends on the linear acting damper. The total effective damper opening can be maintained during temperature modulation. Consequently, a relatively constant inlet duct pressure will produce constant flow from the unit.

Duct static pressure control dampers are located at the start of the duct run and controlled from a sensing device located near the midpoint of the duct system. The high-velocity unit damper has been previously adjusted to produce design air flow with total volume flowing in the cold duct. The static duct controller is now set to maintain the corresponding duct pressure. At all other conditions of flow this pressure will be maintained.

Thermostats can be adjusted to provide full volume flow in the heated duct. The hot duct static pressure controller is set to deliver rated air through the individual units. Flow tests should be retaken at several points to verify constant volume. The regulator setting is adjusted to provide suitable volume.

After the system has been in operation under normal occupancy for a short period, a recheck of the temperature control and air volumes should be made in the event that the actual usage or loading of certain areas is at variance with the design conditions. Unit air volumes may be altered as required. Air distribution patterns should be checked with low-scale velocity reading instruments and with smoke generation devices as required.

J. C. LOUCKS APPOINTED TO RESEARCH LABORATORY STAFF

J. C. Loucks has been appointed to the Research Laboratory staff of the American Society of Heating and Air-Conditioning Engineers it is announced by

J. C. Loucks
Cleveland, Ohio

Prof. B. H. Jennings, Evanston, Ill., chairman, Committee on Research of the Society.

Mr. Loucks will assist the director of research, E. R. Kaiser, in presenting Society research programs to industry and in explaining the results of this research. The Society's Research Laboratory is located in Cleveland, Ohio.

Prior to joining the ASHAE staff, Mr. Loucks has been active in manufacturing, sales and management phases of the building industry.

V – Fan and Air Noises

R. D. LEMMERMAN — Vice President, engineering research and development, Industrial Sound Control, Inc., Hartford, Conn., since 1950 (now division of Koppers Co., Inc.) B.S., chemical engineering, Massachusetts Institute of Technology. Research Associate in laboratory for nuclear science and engineering, MIT, 1949-50. Member: Sigma Xi, *Acoustical Society of America, Institute of Aeronautical Sciences*, ASHAE.

Mr. Lemmerman could not attend, and D. B. Callaway acting in his place reviewed the general position of noise as applied to high-velocity air-conditioning thinking. He followed this with a general discussion of the present state of knowledge in the acoustical engineering field, mentioned the criterion of human tolerance, and gave an illustration of instrumentation presently being used in the field for acoustical measurement.

He also discussed the determination of room noise levels and the development of self-generated noises in high-velocity air-conditioning systems, specifically with regard to fan noise, duct noise and air valve noise. As a part of this discussion, he presented a new method of computing the power level spectrum for noises generated within high-velocity air-conditioning systems.

Interesting data were presented (and omitted here for lack of space) in the form of charts and tables with regard to the design analysis to permit the determination of the extent of attenuation required upstream of air valves, the extent of attenuation required downstream of air valves, and a general discussion as to the various types of sound treatment that will provide required insertion attenuation.

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The President's Page

Society's Place in Student Guidance

During the past year, much has been written and spoken about the lack of available trained, scientific and engineering personnel, both from the viewpoint of our National situation and in contrast with foreign countries, as well as from that of our own competitive industrial demands.

To what extent an engineering society should be concerned with such a problem has probably been questioned by at least a portion of our membership.

Most all will agree that too few of our high school students are enrolling in scientific or engineering curricula. It is at this level that our Chapters can be of material assistance in cooperating with local technical groups, by offering guidance-counselling for the young people who are involved in choosing a career.

Once a student has enrolled in an engineering course at one of the several institutions, it then would appear to be someone's responsibility in our profession to channel information at appropriate intervals to the student, outlining the opportunities available in the heating, ventilating and air-conditioning field.

Society Booklet on Guidance?

Last year, the Public Relations Committee investigated the possibility of our Society preparing a suitable booklet covering career opportunities. Analysis of the projected undertaking showed that several of the companies in our field had already prepared elaborate booklets for this purpose. To create a favorable reaction, it is apparent that any Society-information booklet prepared for this purpose, even though written for the benefit of the whole profession and allied industries, would be costly in preparation and distribution.

Attention was also directed to the experiences of other engineering societies which have prepared films, explaining to the student and to the general public the significance of the role of engineering to the development of our country. When the initial expense of preparing such a film with particular emphasis on various phases of our profession was determined, as well as the cost of keeping the film current, it was found to be an expensive and perhaps unwarranted undertaking.

Curriculum Trend Away From Specialization

Trends in engineering curricula today seem to be away from specialization. A few years ago, many colleges offered mechanical options in heating, ventilating and air-conditioning, but today the student must almost await graduate work for any concentration on these subjects. With this situation developing, it is all the more important that the Society lend encouragement wherever possible to the teaching profession, which is in a position to provide students with helpful knowledge about future trends and possibilities.

Our ASHAE Cooperative Research Program in several of the colleges and universities endeavors to stimulate interest at the student and teacher level. Some manufacturers have taken the initiative to offer scholarships and fellowships to eligible students in many of the schools. Available manpower in our field is a basic problem and it seems that our Society should take the leadership in planning a program that will outline the opportunities available for the young man in a mighty fine profession and business.

It is well for all of us to contemplate that "great needs create great opportunities." Our young people in school today will supply tomorrow the original thinking that will be so badly needed. Each Society member can be helpful to any boy old enough to be thinking about this subject.

John W. James

President
American Society of Heating and Air-Conditioning Engineers

ASHAE RESEARCH PROJECTS—1956

To meet the needs of industry, the profession, and the public, the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS conducts an actively growing research program. The projects listed here are currently active.

This program is carried out at the Research Laboratory of the Society and at the laboratories of various carefully selected and competent cooperating institutions.

The results are published and immediately made available to Society members, to the industry, and to the general public.

Financial support is primarily from the membership of the Society with generous allocation of funds from over 200 companies and trade associations.

For further information concerning any of these projects, write the Director of Research, ASHAE Research Laboratory, 7218 Euclid Avenue, Cleveland 3, Ohio.

Air Cleaning

New methods for obtaining samples of atmospheric contaminants and for measuring particle-size ranges. Air cleaner performance.

Air Distribution

Flow patterns of heated and cooled air issuing into rooms from grilles and from unit heaters.

Air Entrainment

A study of this subject in Hot Water Heating Systems; especially with extended-tube radiation.

Combustion

A program concerned with studying and preventing pulsation noises and resonance in oil- and gas-fired heating equipment.

Comfort

What conditions of temperature, humidity, air motion and radiation are most favorable to comfort and efficiency? Effect of humidity and wall temperatures (radiation).

Cooling

More accurate calculation of summer cooling loads in buildings by new thermal-circuit technique.

Dehumidification

The dynamic characteristics of sorbents have been investigated, and an extension of the program is in the planning stage. A preliminary performance code for sorbent-type dehumidifiers has been developed.

Fan and Air Noise

A program on measurement of noise from fans and air flow in ducts is under way.

Heat Transfer Through Fenestration

Skylights, ordinary windows, metal and canvas awnings, venetian blinds and plastics are being tested to measure solar heat gain.

Heat Pumps and Solar Heat Collectors

Sunshine is a source of winter heat for the heat pump and direct use. Solar collector performance is being evaluated by tests.

Heating Load

More accurate calculation by the new thermal-circuit method.

Hot Water Heating Systems

Gas movement, venting, and gas return to expansion tanks are under investigation. Design problems in high temperature hot water systems are under consideration.

Industrial Ventilation

Research on man cooling and on heat and fume removal from hot masses, hot liquids, etc. is being planned.

Infiltration in Commercial Buildings

Infiltration around doors of public and commercial buildings, single and multi-story, is being measured.

Infiltration in Residences

Helium is used as a tracer gas to measure infiltration (and exfiltration) in residences.

Insulation

The collection and publication of reliable data on thermal conductivities of building and insulating materials.

Metastable State of Water

A study of violent boiling under special conditions in heating systems.

Noise in Piped Liquids

A study of vibrations in flowing liquids, resonance in piping, causes and cures.

Odor Control

The performance of odor-control materials and methods, and the adsorption of odors by rugs, drapes, etc., is being investigated.

Panel Heating and Cooling

The development of practical design data for the engineer is being prepared for publication.

Physiological Factors

The effect of hot dry environments as therapy for edema is under test. The reactions of persons to environment above and below the comfort range are to be studied in a program now being developed.

Weather Data

Are being assembled and organized for maximum usefulness to heating and air-conditioning engineers.

Aerial view of the Mall with the Capitol in the background

Come To Washington In June For The Semi-Annual Meeting

The Committee on Arrangements of the Washington, D.C. Chapter, according to General Chairman P. R. Achenbach, has made most of its plans on the assumption that the Semi-Annual Meeting 1956 will be a June vacation for the whole family. It is suggested that members should bring their families and stay for several days before or after the meeting, June 18-20, because there is too much to see in Washington on a three-day visit.

Naturally the primary purpose for the trip to the nation's capital is to attend the Society's Semi-Annual Meeting 1956, and the members of the Program and Papers Committee, under the chairmanship of W. A. Grant, have arranged for the presentation of 13 papers and 2 symposiums on subjects of compelling interest. These papers and symposiums have been divided into 7 sessions with 1 on Monday morning, 2 on Tuesday morning, 2 on Wednesday morning and 2 sessions on Wednesday afternoon.

The papers selected for the Semi-Annual Meeting 1956 cover many interesting subjects, and are the result of time devoted to research, study and experimentation. Among them are papers on natural convection and radiation in a panel-heated room, small-pipe perimeter heating in a residence, air velocities in two parallel ventilating jets, dependence of water vapor permeability on temperature and humidity, and the effects of unbalanced air pressure on permeance.

Symposiums have been scheduled for Wednesday morning and afternoon to provide an opportunity for everyone to attend both of them. In the morning Prof. C. H. Pesterfield will conduct a Symposium on Codes and Standards, and in the afternoon a Symposium on Residential Air Conditioning will be conducted by Mr. Grant. For each symposium a panel has been arranged of men possessing special knowledge and experience in their respective fields.

Of course the Committee on Arrangements has seen to it that there will be periods of relaxation between the sessions, as well as many attractive diversions for the ladies and children. On Sunday evening there will be a reception in The Shoreham which will provide an opportunity to meet old friends and make new acquaintances. While the members are attending the opening session of the Semi-Annual Meeting 1956 on Monday morning, with Pres. John W. James presiding, the ladies and children will have an opportunity to visit the Federal Bureau of Investigation, and the youngsters may meet some real FBI men.

Brigadier General T. A. Lane, engineer commissioner of the District of Columbia, has accepted an invitation to address the Welcome Lunch-

PROGRAM

Semi-Annual Meeting 1956

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

June 18-20, 1956

The Shoreham **Washington, D.C.** **The Sheraton-Park Hotel**

Monday — June 18

9:00 a.m. REGISTRATION (*Main Lobby*)

9:30 a.m. FIRST SESSION (*West Ballroom*)
Call to Order — Pres. John W. James
Greetings by P. R. Achenbach, Chairman, Committee on Arrangements
Comparative Performance of Indirect Water Heaters, by L. L. Hill and W. S. Harris
Natural Convection and Radiation In A Panel-Heated Room, by T. C. Min, L. F. Schutrum, G. V. Parmelee and John Vouris

9:30 a.m. Ladies' Sightseeing Trip to Federal Bureau of Investigation

12:00 p.m. WELCOME LUNCHEON (*Blue Room*)
Speaker: Brig. Gen. Thomas A. Lane, Engineer Commissioner, Dist. of Columbia

1:00 p.m. Golf Tournament (*Congressional Country Club*)

1:00 p.m. Inspection Trip — David Taylor Model Basin

2:30 p.m. Ladies' Sightseeing Trip to Embassies of Pakistan or Egypt

7:30 p.m. Get-Together Party (*Shoreham Terrace*)

Tuesday — June 19

9:00 a.m. REGISTRATION (*Main Lobby*)

9:30 a.m. SECOND SESSION (*Main Ballroom*)
Call to Order — Vice Pres. P. B. Gordon
Heat Requirements of Snow Melting Systems, by W. P. Chapman and Samuel Katunich
Small-Pipe Perimeter Heating In A Residence, by D. R. Bahnfleth, H. T. Gilkey and C. F. Chen

9:30 a.m. THIRD SESSION (*West Ballroom*)
Call to Order — Vice Pres. E. R. Queer
Air Velocities In Two Parallel Ventilating Jets, by Alfred Koestel and J. B. Austin, Jr.
Dependence of Water Vapor Permeability On Temperature and Humidity, by S. C. Chang and N. B. Hutcheon
Effect of Unbalanced Air Pressure on Permeance, by F. A. Joy and D. R. Fairbanks

9:30 a.m. Ladies' Visit to White House and Capitol

1:00 p.m. Inspection Trips:
(a) Naval Ordnance Laboratory
(b) National Institute of Health

1:00 p.m. Ladies' Sightseeing Trip to Mt. Vernon (*Boat and Bus*)

Wednesday — June 20

9:00 a.m. REGISTRATION (*Main Lobby*)

9:30 a.m. FOURTH SESSION (*Main Ballroom*)
Call to Order — Pres. John W. James
Laboratory For Solar Energy Study at Minnesota, by R. C. Jordan and J. L. Threlkeld
Intermittent Ground Grids For Heat Pumps, by G. S. Smith
Intermittent Heating and Cooling of Buildings, by P. L. Pfennigwerth and Merl Baker

9:30 a.m. FIFTH SESSION (*West Ballroom*)
Call to Order — Vice Pres. P. B. Gordon
Vice Chairman, T. H. Urdahl
Symposium on Codes and Standards — C. H. Pesterfield

12:30 p.m. Ladies' Luncheon and Fashion Show (*Sheraton Park Hotel*)

2:00 p.m. SIXTH SESSION (*Main Ballroom*)
Call to Order — Vice Pres. E. R. Queer
Vice Chairman, W. A. Grant
Symposium on Residential Air Conditioning
L. H. Haeger, Moderator

2:00 p.m. SEVENTH SESSION (*West Ballroom*)
Call to Order — Pres. John W. James
Performance of One-Row Tube Coils With Thin-Plate Fins, Low Velocity Forced Convection, by D. G. Shephard
Temperature and Humidity Effect on Odor Perception, by W. F. Kerka and C. M. Humphreys
The Indirect Evaporative Air Cooler, by J. R. Watt and R. A. Bacon
Report of Resolutions Committee
Unfinished Business
New Business
Adjournment

6:30 p.m. Social Hour (*West Ballroom*)

7:00 p.m. SEMI-ANNUAL BANQUET (*Terrace Banquet Room*)

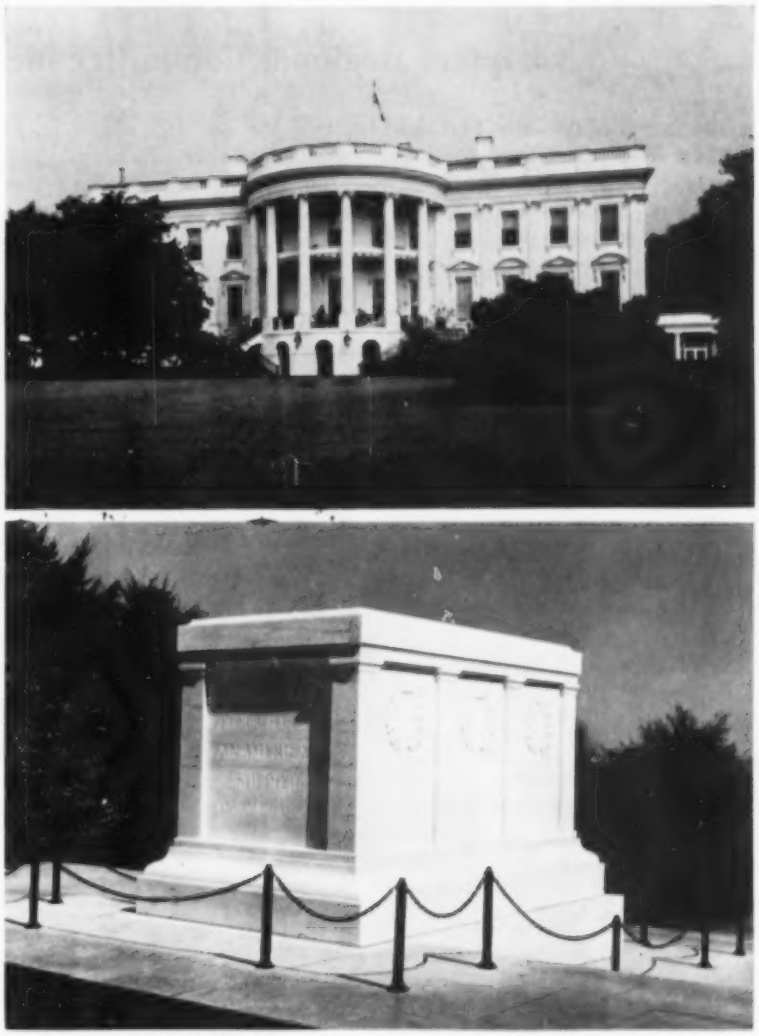
eon at noon on Monday. Following the luncheon the afternoon has been set aside for the annual ASHAE golf tournament for the Past Presidents' Research Bowl, Eichberg Memorial Cup and Paul Bunyan Trophy. In addition there will be special contests and tournaments for the ladies. The tournament will begin at 1 p.m., and it will be held at the Congressional Country Club. Also planned for Monday afternoon are visits to the Pakistan and Egyptian embassies and the Islamic Center, as well as an inspection trip to the David Taylor Model Basin to see how ship and submarine hull models are tested by the U. S Navy.

The entertainment committee, under the chairmanship of J. H. Broome, has arranged a get-together party for Monday evening on the Shoreham Terrace, consisting of dinner, dancing and entertainment.

Tuesday morning First Vice Pres. P. B. Gordon will call to order the second session at which time papers on snow melting and residential perimeter heating will be presented. Simultaneously, Second Vice Pres. E. R. Queer will convene the third session, consisting of papers on air velocities, water vapor permeability, and effect of unbalanced air pressure on permeance.

For the same morning the ladies committee, under the chairmanship of Mrs. J. H. Broome, has arranged a visit to the White House with the buses leaving the hotel at 9:30 a.m. In the afternoon there will be a boat trip to Mt. Vernon and return by bus with a stop at Arlington Cemetery and Fort Myer to watch the changing of the guard. Inspection trips to the National Institute of Health and the Naval Ordnance Laboratory are also scheduled for Tuesday afternoon with buses leaving at 1:00 p.m.

Wednesday morning the fourth session will be opened by Pres. John W. James, and at the same time Prof. C. H. Pesterfield will conduct the Symposium on Codes and Standards which comprises the fifth session, conducted by First Vice Pres. P. B. Gordon. Papers on solar energy, intermittent ground grids for heat pumps, and intermittent heating and cooling of buildings will be offered at the session convened by President James.



The upper photograph is the White House in Washington, D.C., and pictured immediately above is the Tomb of the Unknown Soldier at Arlington National Cemetery.

At 12:30 p.m. on Wednesday the ladies have a style show and luncheon in the Sheraton Park and thereafter free time until the social hour at 6:30 p.m. and the Semi-Annual Banquet which begins at 7:00 p.m.

For ASHAE members and friends Wednesday afternoon offers the sixth and seventh sessions. The sixth session beginning at 2:00 p.m. with Second Vice Pres. E. R. Queer presiding, will be the Symposium on Residential Air Conditioning with W. A. Grant as vice chairman and L. H. Haeger as moderator. The final session, also beginning at 2:00 p.m. with Pres. John W. James presiding, will consist of papers dealing with low-velocity forced convection, temperature and humidity effects on odor perception, and the indirect evaporative air cooler.

Climaxing the three days of sessions, inspection tours and sightseeing in the nation's capital is the Semi-Annual Banquet, and for the present Chairman Achenbach says the Committee on Arrangements prefers to keep secret its plans for that evening.

It is hard to resist the call to Washington and the Semi-Annual Meeting 1956, so say yes today and get off those reservations without delay! Consult travel agent for schedules.

Chapters Regional Committee Meets in Atlanta

The second of the series of Chapters Regional Committee Meetings was held in Region 5, March 12, 1956, at the Dinkler Plaza Hotel, Atlanta, with Regional Director C. B. Gamble, New Orleans, presiding.

Those responding to the roll call representing the various chapters were: F. W. Bull, Atlanta; W. M. Pace, Bluegrass; J. H. Maloney, Delta; J. F. Naylor, Jr., Baton Rouge; W. G. Robertson, Baltimore; B. L. Palmer, Mississippi; C. E. Amick, Northern Piedmont; G. C. Garrett, Southern Piedmont; R. K. Rouse, South Carolina; W. L. Henson, Memphis; E. R. Simpson, Jr., Virginia; P. R. Achenbach, Washington, D.C. Alternates present were: J. A. Marshall, Atlanta; I. M. Richardson, Delta; and W. P. Wells, Southern Piedmont.

T. A. Barrow, Jr., president of Atlanta Chapter, extended greetings to the visiting members, and Chairman Gamble read a message from Second Vice Pres. E. R. Queer, University Park, Pa.

Pres. John W. James, Chicago, in his talk on the *Society and Its Future*, pointed out the significant milestones in the growth and the expansion of the Society's activities.

First Vice Pres. P. B. Gordon, New York, presented the *Philosophy of the Regional Plan of Chapter Operation* and with the aid of slides stated the Society's objectives, the mechanisms that permit it to accomplish its purposes, and gave a detailed analysis of the conception and development of the Regional Plan between 1947 and 1955. He described the seven changes that it provided in operating procedures.

(l. to r.) P. B. Gordon, first vice president, New York; C. B. Gamble, regional director, New Orleans; and John W. James, president, Chicago

There was a long discussion of items for the chapters agenda including: (*a*) plans for Society and chapter growth to keep pace with the needs of the expanding field of heating, ventilating, and air conditioning; (*b*) need of model safety code for minimum heating, ventilating, and air conditioning requirements; (*c*) guidance in promoting the growth of existing chapters; (*d*) need of a brochure to create interest in the field of heating, ventilating, and air conditioning for all colleges conferring engineering degrees.

An exchange of information was given on chapter operations, including meeting attendance, dues rates, collections, meal prices, and on methods of developing meeting programs.

The members selected a member and two alternates for the Nominating Committee of the Society from Region 5 as follows: J. S. Burke, New Orleans, C. B. Priester, Baltimore, first alternate, and F. W. Bull, Atlanta, second alternate.

An invitation to hold the next meeting of the Committee in New Orleans in 1957 was presented by Delta Chapter and will be referred to the Regions Central Committee.

The members enjoyed a mid-day luncheon and after the meeting adjourned the group joined the Atlanta Chapter members for refreshments and the regular monthly dinner meeting at Mammy's Shanty Restaurant. President James was the featured speaker. He spoke on the subject of *Humanity Benefits from Air Conditioning*.

Members and alternate members in attendance at luncheon during Chapters Regional Committee Meeting for Region 5, held in Atlanta

(left) Atlanta Chapter Officers: J. G. Croley, member of Board of Governors; J. A. Marshall, secretary; T. A. Barrow, Jr., president; and F. W. Bull, vice president

THE NEWEST ASHAE GUIDE

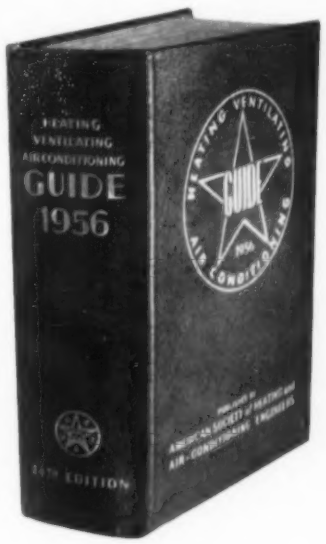
Prepared for practicing engineers — revised and up to date — the 34th Edition is now ready. It represents the combined efforts of many outstanding engineers in preparing an authoritative text and reference book.

[HEATING, VENTILATING, AIR CONDITIONING GUIDE 1956, *34th Edition, size 6 x 9 in., blue cloth bound, gold stamped,* AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, *62 Worth Street, New York 13, N. Y., single copy price* $12.00.]

EACH year the text section has to be increased to provide space for the steadily growing technical data needed by engineers — this in spite of every effort made to condense text and to reduce space. The 34th Edition is no exception, for the Technical Data Section contains 1176 pages — a greater number than ever before. The Catalog Data Section presents reference material concerning the products of 335 manufacturers of equipment.

THE GUIDE is the result of the efforts and contributions of many engineers. Its data are drawn from all available authoritative sources. Much of it comes from the research program of the Society. Changes in codes and standards are important sources. So, too, is the work of various trade groups and of private and institutional researchers. Changed practices by engineers and improved designs of equipment all contribute to the technology and take their place in this array of data. All this faithful work of preparation of text is carried out under the guidance and co-ordination of the Guide Committee whose members are: W. M. Wallace, II, *chairman;* P. R. Achenbach, Albert Giannini, R. A. Gonzalez, N. B. Hutcheon, A. T. Jones, M. W. Keyes, A. A. Marks, J. F. Sandfort, B. H. Jennings, *ex officio,* and Carl H. Flink, *technical secretary.*

In this 34th Edition, sixteen chapters are substantially changed, some of them being almost completely rewritten. Special attention is given to the presentation of heat transmission coefficients of building materials. One result is that design values for conductivity and conductance are included for many more materials than in any earlier edition. New tables make it easy to compute the effect of



adding air spaces or insulations to walls, ceilings or floors. All this important revision of coefficients was performed by the Technical Advisory Committee on Insulation with assistance from the staff of the Society Research Laboratory.

Other material which has been rewritten is that having to do with automatic control, which describes current control methods and equipment using the latest nomenclature.

The extent of the revisions and of the importance of the new and added data can be judged from the following list of some of the most notable changes made:

Chapter 1 — Terminology: Important revisions are made in several definitions to make them more exact.

Chapter 4 — Fluid Flow: Most of the illustrations are improved. There are clarifications in text.

Chapter 13 — Cooling Load: Weather design data is added for 21 Canadian cities, and numerous revisions are made in the text.

Chapter 17 — Chimneys and Draft Calculations: The discussion of the theory of draft calculations is rewritten. The sections on residential chimneys and gas appliance chimney requirements are revised and enlarged.

Chapter 18 — Estimating Fuel Consumption for Space Heating: The table of degree days is extended to include 287 U.S. and 40 Canadian cities using up-to-date information furnished by the *U. S. Weather Bureau* and the *Canadian Meteorological Service.*

Chapter 23 — Radiators, Convectors, Baseboard and Finned-Tube Units: Sections are added to supply information on baseboard and finned-tube units of present design. The chapter is largely rewritten.

Chapter 24 — Panel Heating: The section on snow melting is rewritten to cover recent developments in this field. New design tables were added. Improvements are made in the panel heating sections.

Chapter 26 — Unit Air Conditioners and Unit Air Coolers: Much of the text is rewritten to describe present practice in use of unit coolers and the method used for their selection.

Chapter 27 — Pipe, Fittings, Welding: New tables indicate the suitability of various pipe, tube and fitting materials for different applications. Characteristics of drainage, waste and vent pipe and tube are discussed in text and added to the table on dimensions and properties of copper tube..

Chapter 30 — Central Systems for Air Conditioning: The chapter is enlarged and largely rewritten with new text and diagrams describing year-round -systems, unitary systems, high and low pressure convectors, dual duct and fan coil units.

Chapter 32 — Air Duct Design: Rewritten by a subcommittee of the Technical Advisory Committee on Air Distribution to simplify explanation and use of formulas for duct design. New tables are added to extend data on friction losses in elbows, fittings and area changes.

Chapter 36 — Heating and Cooling Coils: Information on coil selection revised to indicate practical considerations involved. An example is added to show method of calculating the cooling load on coils.

Chapter 53 — Codes and Standards: Revisions are made to show latest editions and to include new standards in the field of heating and air conditioning.

The technical data continues to be presented under the 7 sectional heads which have been used in recent editions. The practice of retaining the same arrangement of the data is a convenience much appreciated by those who use the annual editions as they become available. Retained also are the edge indexes for both the Technical Data and the Catalog Data Sections. As in earlier editions, the 24 x 32 in. ASHAE Psychrometric Chart is included.

Region 6 Chapters Meet in Dallas

THE North Texas Chapter was host to the Chapters Regional Committee Meeting of Region 6 at the Statler Hilton Hotel, Dallas, on March 19.

With members selected by the four Texas Chapters, the two chapters in Oklahoma and the chapters from Arkansas, Louisiana, and New Mexico, respectively, present, D. M. Mills, regional director, Houston, called the meeting to order at 10 a.m. The total registration was 62 and there were also four visiting ladies.

The members and alternates present were: Arkansas, J. W. Thompson; Shreveport, H. E. Scott; New Mexico, Jack K. James; Northeastern Oklahoma, C. H. Dollmeyer; Oklahoma, F. R. Denham and W. R. Johnson; North Texas, G. H. Meffert and E. T. Gessell; South Texas, A. B. Ullrich, Jr. and J. C. Lewis; Southwest Texas, D. T. Kern; West Texas, L. F. Davidson.

During the morning session A. B. Ullrich, Jr., Houston, was elected committee secretary.

Society President John W. James, Chicago, talked about *The Society and Its Future*.

P. B. Gordon, first vice president of the Society, presented *The Philosophy of the Regional Plan of Chapter Operation*.

Chairman Mills cited several of the subjects for the Chapters Agenda that had developed at the Portland and Atlanta meetings. It was proposed that Council give more consideration to scheduling additional meetings in the South.

Left to right — P. B. Gordon, first vice president; E. R. Queer, second vice president; John W. James, president; A. B. Ullrich, Jr., committee secretary; and D. M. Mills, regional director

It was felt that a Regional Meeting should be scheduled each year in one of the Regions and should be held in cities which would not have the opportunity of being host to an Annual or Semi-Annual Meeting.

At luncheon, with 50 present, C. Rollins Gardner, Ft. Worth, introduced guest speaker Dr. Trent C. Root, vice president and comptroller of Southern Methodist University. His witty remarks on educational trends and the problems of relieving the shortage of engineers were greatly enjoyed.

At the afternoon session Second Vice Pres. E. R. Queer, Pennsylvania State University, discussed the role of *Engineers and Their Relationship to People*. He cited the need for better means of communication between the scientist, the physicist, the doctor, the engineer and the public. He emphasized the responsibilities of the engineer in serving mankind.

In a discussion of chapter operations discussion leaders presented the following subjects: Membership—G. H. Meffert, Dallas; Programs—F. R. Denham, Oklahoma City; Speakers—H. E. Scott, Shreveport; Attendance—J. K. James, Albuquerque; Meals—A. B. Ullrich, Jr., Houston; Publicity—D. T. Kern, San Antonio; Meeting Announcements—L. Davidson, Lubbock; Dues—C. H. Dollmeyer, Tulsa.

A member and two alternates to serve on the 1957 Nominating Committee were selected.

B. Segall, Austin, announced the desire of the members in that area to form a chapter and presented to D. M. Mills, regional director, a petition for a charter containing the signatures of 49 members and prospective members, also the applications of 25 candidates.

C. H. Dollmeyer, Tulsa, presented an invitation from the Northeast Oklahoma Chapter, inviting the members in Region 6 to hold the 1957 Chapters Regional Meeting in Tulsa. This will be considered by the Regions Central Committee.

The North Texas Chapter Committee chairmen in charge were: Arrangements, H. George Gregerson; Vice-Chairman, George H. Meffert; Reception and Registration, T. H. Anspacher; Luncheon, R. L. Patton; Entertainment, E. J. Hatzenbuehler; Transportation, John A. Ray; Promotion and Publicity, Alan Smith; and Ladies, Mrs. Elmer Gessell.

Left to right, front row — D. T. Kern, J. K. James, C. H. Dollmeyer, F. R. Denham, J. W. Thompson

Summary of Chapter Meetings*

Journal Section

Northern Alberta — 62nd Chapter

The charter meeting of the Society's 62nd Chapter was held February 22, at the Park Hotel, Edmonton, Alberta. John W. James, Chicago, president of the Society, presented the Charter for the Northern Alberta Chapter, with a group of 75 in attendance.

Chairman W. C. Woods welcomed the visitors and introduced the members at the head table. Greetings on behalf of the Provincial Government were given by the Honorable Raymond Reierson. Alderman Clifford Roy spoke on behalf of the City of Alberta. J. Graham Dale, vice president of the *Association of Professional Engineers of Alberta*, H. L. Roblin, chairman of the Edmonton Branch of the *Engineering Institute of Canada*, H. L. Bouey, president of the *Alberta Association of Architects*, and Prof. J. A. Harle, representing the University of Alberta, conveyed the greetings of their organizations and welcomed the Northern Alberta Chapter.

Chairman Woods then expressed appreciation for the interest of those individuals and chapters who sent telegrams and letters of congratulations. D. L. Angus, president of the Ontario Chapter, was introduced and brought the personal greetings of the Ontario Chapter members.

A report of the nominating committee was presented and the unanimous election of the following officers was announced: *President* - W. C. Woods; *Vice President* - P. M. Butler; *Secretary* - E. K. Cumming; *Treasurer* - R. A. Williams; *Board of Governors*: H. A. G. Maybank, A. N. Nordstrom, D. A. Peckinpaugh, R. G. Proudfoot, and Kornelius Seimens.

President James expressed the best wishes of the Council and the Society for the future success of the Alberta Chapter and spoke in some detail of the Society's work in the field of human comfort. He outlined the research program for which the expenditure this year is estimated at $225,000. He also spoke of the size of the heating, ventilating, and air-conditioning industry and gave some impressive figures of the volume of expenditures in this field.

John H. Fox, Toronto, regional director of Region 7, spoke briefly on the value of the chapter to the individual and then presented a gavel to Pres. W. C. Woods. The gavel was a gift from the 61st Chapter at Baton Rouge, La.

A. V. Hutchinson, New York, executive secretary of the Society, then presented the chapter record books to E. K. Cumming, chapter secretary.

At the conclusion of the meeting, Vice President Butler extended a vote of thanks to the visiting members and the other guests, as well as to Jack Dennistoun, who provided the musical entertainment.

• *ARKANSAS*: Vice Pres. J. W. Thompson, presiding at the January meeting, reported that a past president's pin had been presented to Jack Franklin by Pres. J. L. Brown. Secy. H. H. Himstedt read an invitation from *AIEE* to attend a special program on atomic energy. A report on the new chapter bulletin, *You Name It*, was made by O. L. McCallister, Jr., who had received an expression of appreciation from the board of governors previous to the meeting for the fine work done on the first bulletin issue. Several members commented favorably on the arrangements the entertainment committee had made for the successful Christmas party.

H. E. Allen introduced the guest speaker, Kenneth Cunningham, Acme Industries, Inc., Jackson, Mich. Mr. Cunningham gave a complete report on the use of circulating hot and cold water as applied to the air conditioning and heating industry. He showed a thorough working knowledge of both the technical and practical application of this principle to our industry. When dealing with some of the fundamental piping designs, he illustrated them on the board. He concluded with a detailed account of a recent radiant cooling job on which he had encountered several practical problems, outlining his solutions. The meeting ended on a high note of discussion amongst the members and guests present. Attendance 29.

• *ATLANTA*: The assistant superintendent of DeKalb County school system, S. A. Moss, spoke on schoolhouse construction plans and problems at the January meeting, presided over by Pres. T. A. Barrow, Jr. Of interest to the members were Mr. Moss' comments explaining that heating and ventilating practices and equipment were a major consideration in plans for a tremendous school building program. Attendance 68. Attendance ratio 0.39.

• *BATON ROUGE*: G. C. Kerr, Johns-Manville Sales Corp., New Orleans, La., who is a member of the TAC on Sound and Vibration Control and a past president of Delta Chapter, was the guest speaker in January. Following his presentation by W. J. LeBlanc, Mr. Kerr discussed *Acoustics in Engineering*. His talk and demonstration of a *noise meter* received a standing ovation. Attendance 26. Attendance ratio 0.36.

• *BLUEGRASS*: Packaged boilers were the subject of an informative talk given in January by L. L. Fowler, sales manager, and R. V. Noah, special design engineer, both of Dutton Boilers, Division Hapman-Dutton Co., Kalamazoo, Mich. T. D. Hall presented the speakers at this meeting presided over by Pres. W. M. Pace.

• *BRITISH COLUMBIA*: Two films were featured at the January meeting. Ler Cripps, United Air Lines, presented an excellent sound movie on the State of California, and M. E. Minaker, branch manager, Minneapolis-Honeywell Regulator Co., Ltd., Vancouver, B.C., showed a special technical film on *The Importance of Adequate Heating and Ventilation for Modern School Building*.

On the business side of the meeting, a discussion took place concerning the forthcoming change in ASHAE regional areas. Attendance 40. Attendance ratio 0.39.

• *GOLDEN GATE*: L. E. Dwyer was named at the January meeting as the Golden Gate Chapter's selection for the outstanding young engineer of the year.

Featured at the meeting was a talk by Russ Green, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., on the history of flame safety control equipment from the early crude by-metal safety pilot to the new electronic rectifying flame detection equipment.

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

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Business of the meeting, presided over by Pres. D. E. McLeod, included the adoption of new by-laws as amended from the floor. Secy. Herb Duncan read letters inviting the membership to attend the meeting of Region 4, Chapters Regional Committee. Attendance 67. Attendance ratio 0.27.

• *INLAND EMPIRE*: J. D. Kroeker, consulting engineer, J. Donald Kroeker & Assocs., Portland, Ore., who was introduced at the January meeting by R. O. Haneberg, presented a gavel to the Inland Empire Chapter from the Oregon Chapter. Mr. Kroeker, as guest speaker of the meeting, described in detail how the then proposed new regional plan of the Society would operate. His remarks were well received by all the chapter; they cleared up many points about which the members had been in doubt.

Pres. F. W. Jenkinson appointed E. T. Case, J. R. Morris and J. A. Doyle on a committee to make a selection of an engineer of the year from the Inland Empire Chapter. Attendance 34. Attendance ratio 0.51.

• *KANSAS CITY*: Speaking on behalf of the *ASRE* at the joint annual ASHAE-*ASRE* meeting held in January, R. W. Tobey extended a cordial invitation to all to attend their February meeting.

Pres. A. S. Hurt, Jr., ASHAE Kansas City Chapter, called on G. H. Stoffer to introduce the speaker, J. H. Erb, chief engineer, Carrier Corp. Chicago District. Mr. Erb delivered a most interesting and well received discussion on *Refrigeration Piping Problems*. The talk was quite effectively illustrated with slides showing many methods of pipe arrangement.

A motion to adopt the revised ASHAE chapter by-laws, subject to the approval of the Charter and By-laws Committee of the Society, was carried unanimously. Attendance 101. Attendance ratio 0.26.

• *MEMPHIS*: Vice Pres. W. L. Henson presided at the joint ASHAE-*ASRE* meeting in January. The topic of the evening, *Engineering Aspects and Considerations in the Design of Heat Pump Systems*, was covered by Kenneth Cunningham, manager, application department, Acme Industries, Inc., Jackson, Mich. Mr. Cunningham, who was introduced by R. E. Larkin, reviewed the operation of heat pumps which reverse condenser and chiller functions with the same equipment to produce heating or cooling as desired. Mr. Cunningham believes that heat pumps are very useful industrially where one process must be simultaneously cooled while another is heated.

W. C. Jordan, Jr., was appointed chairman of the membership committee, succeeding J. P. Manis who has been transferred to Chicago. C. L. Brown, Jr., was appointed to this committee. Following discussion of future combined meetings of ASHAE and *ASRE* Memphis Chapters, a suggestion was made that the chapter presidents work out a method by which joint meetings may be held, particularly when the program is of interest to both groups. Attendance 37.

• *MISSISSIPPI*: Presiding at the January meeting, Vice Pres. J. W. Doggett, Jr., reminded the members that Pres. B. L. Palmer was attending the Annual Meeting in Cincinnati.

C. M. Broad reported that Mississippi State College had attempted to hold a short course in *Heating and Air Conditioning*, but could not get an enrollment started. He stated that Professor Holmes requested that the Mississippi Chapter help the college in developing such a course. A motion was made and carried that the chapter should give their assistance and that a committee be appointed by the board of governors for this project.

Selling the Need for Air Conditioning was the topic of a talk by James Briggle, who was introduced by T. N. Dent. Attendance 24.

• *NEW YORK*: Two speakers were presented in January by Pres. Albert Giannini. H. S. Birkett, assistant secretary, The Brooklyn Union Gas Co., New York, N. Y., noted the developments taking place in the New York area to insure a supply of natural gas for gas users. He demonstrated with charts showing the course of gas pipelines bringing gas into the area from the South and illustrated methods of storage of gas in depleted gas fields to insure adequate reserve capacity for peak loads in winter.

Lew Wagner, Consolidated Edison Co. of New York, Inc., mentioned the problems connected with change-over from manufactured to natural gas without disrupting gas service. He described the procedure used in preparing customer appliances for the change and cited cases in which industrial users had their burners prepared in advance, so that it was only necessary to install proper orifices on the day of the change of gas.

The showing of a movie, *The Renaissance of Appalachian Gas*, followed the talks. This film portrayed the work involved in preparing old depleted fields for gas storage.

A special feature of the meeting was the presentation of a Life Membership certificate to N. T. Sellman. President Giannini reviewed the distinguished career of Mr. Sellman, noting his promotion of the use of gas and his leadership in founding the *A.G.A.* Testing Laboratories. Attendance 75. Attendance ratio 0.17.

• *NORTH TEXAS*: J. A. Ray, immediate past president, introduced the chairmen of all the committees who served during his term, each of whom gave a short report on their activities at this January meeting. Pres. H. G. Gregerson introduced the new officers and the 1956 committee chairmen and their advisors. The committee chairmen in turn introduced their committee members. These chairmen are as follows: *Program*—F. L. Gray, Jr., *Publication*—R. M. Baker; *Hospitality*—B. W. Clark; *Membership*—J. D. Tuttle; *Attendance*—J. F. Kistenmacher; *Technical Advisory*—R. E. Miller; *Parliamentary*—C. C. Young and *Publicity*—A. H. Smith. G. H. Meffert and E. T. Gessell were introduced as the member and alternate member of the Chapters Conference Committee.

The past president's pin was presented to Past President Ray by P. N. Vinther. Attendance 72. Attendance ratio 0.29.

• *NORTHEASTERN OKLAHOMA*: A discussion of coil applications in the field was presented in January by W. P. Glancy, manager, southwestern district, Aerofin Corp., Dallas, Tex. F. M. Thomas introduced the speaker, who covered such topics as methods of trapping steam coils; applications and piping of non-freeze coils, water coils and DX coils; and coil air stratification. Pres. H. W. Meinholtz was the presiding officer. Attendance 31. Attendance ratio 0.40.

• *OKLAHOMA*: Pres. J. R. Patten presided at the January meeting at which W. P. Glancy, manager, Southwestern District, Aerofin Corp., Dallas, Tex., talked on *Coil Application*. F. R. Denham introduced the speaker. The discussion opened with common difficulties encountered with non-freeze coils in actual installations. Several recommendations for methods of piping non-freeze coils were advanced. Methods of control were noted. Brief mention was also made of hot water coils, chilled water coils and direct expansion

Plaque Presented at Cincinnati

F. J. Kurth presents plaque to President Haines sent to the Society by Dr. Ing. Kurt E. Nickel from W. Germany, as a memento of the visit to the United States of Dr. Nickel and Drs. Ing. Paul Ammo, Werner Halbig, Fritz Kastner, and Hans Sauer, and their attendance at the Society's Annual Meeting in Philadelphia in January 1955

At a recent North Jersey Chapter meeting A. D. Brandt, industrial hygiene engineer, Bethlehem Steel Co., Medical Division, Bethlehem, Pa., spoke on the problems in factory ventilation and air conditioning, followed by chapter presentations. (LEFT) Pres. C. H. Smith presents bronze plaque to Past Pres. H. M. Patrick in appreciation of his services to the chapter. (RIGHT) M. W. Ehrlich receives a Certificate of Life Membership in the Society

coils. At the conclusion of Mr. Patten's talk, enthusiastic applause expressed the appreciation of his audience. Attendance 86. Attendance ratio 0.58.

• *ONTARIO*: R. St. Clair Mathison acted as the moderator of a panel discussion on *Refrigeration Machines* at the January meeting. Allen Beverley, Canadian Ice Machines Co., Ltd., spoke on *Reciprocating Refrigeration Machines;* B. E. Judges, manager of refrigerating sales, Trane Co. of Canada, Ltd., Toronto, treated *Centrifugal Refrigeration Machines;* and Victor Cole, Carrier Corp., Syracuse, N. Y., covered the *Absorption Type of Refrigeration Machines.* A number of questions were addressed to the panel members, relating to the merits of the various machines discussed. Pres. D. L. Angus was the presiding officer. Attendance 104.

• *PACIFIC NORTHWEST*: The *ASRE*-ASHAE joint annual meeting was held in January with the *ASRE* acting as host. Chapter officers of both societies were introduced. Pres. P. I. L. Winsor briefly reviewed the ASHAE chapter activities and announced that E. F. Dill will replace F. S. Ozanne, who resigned as chairman of the membership committee.

The speaker of the evening was Cecil Boling, *ASRE* national treasurer, and president, The Bush Manufacturing Co., West Hartford, Conn. Mr. Boling's subject was *Improved Refrigerant Control by Using Heat Exchangers.* The many questions directed to him during the question period indicated an enthusiastic response to the talk and pictorial presentation. Attendance 97.

• *PITTSBURGH*: A past president of the chapter, T. F. Rockwell, consulting engineer, Pittsburgh, Pa., was the main speaker at the January meeting. Mr. Rockwell, who was introduced by Program Chairman E. J. Busch, spoke on thermodynamics. He gave a detailed analysis of the heat pump for heating and cooling applications. He concluded by weighing the merits of the heat pump for use in the Pittsburgh area at the present time. Pres. C. L. Benn was the presiding officer at the meeting. Attendance 116.

• *SOUTHERN PIEDMONT*: The slate of officers presented in January by R. S. Fullerton, chairman of the nominating committee, was elected at that same meeting. New officers for 1956 are as follows: *President*—J. A. Rice; *Vice President*—G. C. Garrett; *Secretary*—E. D. Streng and *Treasurer*—J. R. Clark.

Newly-elected President Rice, a member of the Chapters Conference Committee, reported on the 62nd Annual Meeting in Cincinnati. Pres. L. F. Lawrence, Jr., turned the meeting over to

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the new president before adjournment. Attendance 19. Attendance ratio 0.25.

• *TOLEDO*: A report by Robert Greenwald in January on a course in *Fundamentals of Air Conditioning* to be given at Toledo University brought a response from 12 members who expressed their desire to take the course.

A committee, consisting of Mr. Greenwald, R. C. Moorhead, G. W. Bleckner and G. H. Frost, was selected to appoint a candidate from ASHAE for engineer of the year.

Pres. C. F. Hoffman turned the meeting over to J. M. Groskopf, program chairman, who introduced the speaker of the evening, K. E. Robinson, ventilation engineer, Research Laboratory Division, General Motors Corp., Detroit, Mich. The subject he selected was *Comfort and Makeup Air for Industry.* Attendance 51.

• *WESTERN NEW YORK*: Pres. C. W. Kaupp extended the chapter's appreciation to all members and guests attending the January meeting in spite of the bad weather condition. The meeting was turned over to the chairman, J. P. Guerra.

Three speakers were featured. R. H. Meyerhans, director of engineering, Fedders-Quigan Corp., Buffalo, N. Y., chose *Window Type Air Conditioning* as his subject. He compared window units to other types of air conditioners as to cost, installation and control features for homes, stores, apartment houses, hotels, etc.

H. E. Wood, field engineer, General Electric Co., Schenectady, N. Y., in speaking on *Central Air-Conditioning Systems,* covered the residential combination unit — warm air furnace and add-on air conditioning.

The third speaker, C. A. McKeeman, supervisor, heating and cooling school, American Radiator & Standard Sanitary Corp., Buffalo, N. Y., discussed *Liquid Heating and Cooling.* His subject covered flexibility and space saving. Other topics included were installation problems, balancing of systems, the use of chillers, and controls. Attendance 60.

John E. Haines, Minneapolis, Minn., addressing a joint meeting of the Virginia Chapter and the Engineers' Club of Hampton Roads at the Norfolk Yacht and Country Club. Mr. Haines, as president of the Society, spoke on "The Next Ten Years." The officers of the Engineers' Club are seated on President Haines' left and on his right are chapter officers: T. B. Carpenter, president; C. G. Conaway, secretary; D. C. Delinger, treasurer; and Allan Miller, program chairman

Honored by Life Membership

Albert L. Baum, New York, N.Y.—A member of the firm of Jaros, Baum & Bolles, New York, A. L. Baum has been engaged in the heating and ventilating profession from his college days. Since 1932 he has been a consulting engineering member of the firm, which was earlier known as Jaros & Baum.

A native New Yorker, Mr. Baum was born on March 8, 1889, and received his A.B. from Columbia University in 1909 and M.E. in 1911. Having completed his education, he joined Nygren, Tenney & Ohmes, New York City, and was shortly placed in charge of heating, ventilating and steam power projects. During the last war Mr. Baum prepared designs for the U. S. Navy Department for shore station work in connection with the Navy's Aviation Program. Buildings for which Mr.

A. L. Baum
New York, N.Y.

Baum has designed air-conditioning systems include the U. S. Senate Office Building Annex, Washington, D. C.; the Mutual Life Insurance Co. Building, and Tiffany and Co., New York City.

He has been a member of the Society since 1916 and is affiliated with the New York Chapter.

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Aloysius J. Huch, Minneapolis, Minn.—Previous to his retirement last year, A. J. Huch was connected with American Radiator & Standard Sanitary Corp. or its predecessor in Minneapolis for over 48 years. A member of the Society since 1919, Mr. Huch served the Minnesota Chapter as secretary-treasurer in 1927, president in 1928 and a member of the board of governors, 1929.

Born in Minneapolis on February 11, 1890, Mr. Huch was graduated from De La Salle High School night classes in heating and ventilating at the University of Minnesota. He joined the Central Supply Co., Minneapolis, as a heating salesman in 1906, progressing to sales manager some years later. He served as secretary and treasurer of Central Supply Co. when it became a division of American Radiator and Standard Sanitary Corp. In March

A. J. Huch
Minneapolis, Minn.

1955, he retired from the position of Minneapolis branch manager of Amstan Supply, a division of American Radiator.

Present occupation: building toys for 14 grandchildren.

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Charles R. McConner, Kalamazoo, Mich.—With a record of many years of service in the employ of the Clarage Fan Co., Kalamazoo, Mich., C. R. McConner was named vice president in charge of sales last year. A member of the Society since 1922, he was elected to the presidency of the Western Michigan Chapter for 1938 and the board of governors for 1939, having previously served as treasurer and vice president.

Mr. McConner was born in Salem, Ohio, and received his civil engineering education at Swarthmore College. Prior to World War I, he worked for the

C. R. McConner
Kalamazoo, Mich.

Buckeye Engine Co. in his home town and the Alliance Machine Co. in Alliance, Ohio. During the war, he was a lieutenant in the U.S. Army.

First joining Clarage Fan Co. as a sales trainee in 1919, he was sent to Chicago as district sales manager, upon completing his training course. After 8 years in this employ, he went to Detroit as district sales manager of the York Heating & Ventilating Corp. In 1931, he returned to Clarage Fan Co. in the position of general sales manager.

For a number of years he has been president of the Kalamazoo County Humane Society. He belongs to the Masons, the Elks, and Kalamazoo Country Club.

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Fabian C. McIntosh, Pittsburgh, Pa.—A highly active member of the Society, F. C. McIntosh served for six years as a member of Council, 1929-31 and 1933-35. Most of his business career has been spent with the Johnson Service Co., as manager of the Pittsburgh office since 1919.

After joining the Society in 1917, he served on various committees. He was chairman of the Committee on Research in 1942 and of its Executive Committee that same year. Through the years he also served as chairman of the Guide Publica-

F. C. McIntosh
Pittsburgh, Pa.

tion, Publication, Finance, Membership, Constitution and By-Laws, and Nominating Committees. He was chairman of the Committee on Rules of Award for the F. Paul Anderson Medal and of the first Award Committee. In addition, he held membership at different times on several technical advisory committees.

Mr. McIntosh was president of the Pittsburgh Chapter in 1940. Intermittently, he has been elected to the office of vice president and to the board of governors of that chapter.

He was born in Olean, N. Y., on September 4, 1890. He received a B.S. in civil engineering from the University of Wisconsin in 1913. For a few years he worked as a surveyor and draftsman for the Pennsylvania Co., Chicago, and the Universal Portland Cement Co. He first joined Johnson Service Co. in 1917. After a period of military service, he returned to that company and has remained with them ever since.

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Elmer W. Rietz, Skokie, Ill. — Since 1920 E. W. Rietz has been connected with the Powers Regulator Co. For a number of years he has been a director of the company and is presently export sales manager, General Sales Division, Skokie.

Mr. Rietz attended grade school and the R. T. Crane Technical High School in Chicago, his birthplace on December 2, 1890. Following the study of mechanical engineering at Armour Institute of Technology, he was first employed as an inspector and instructor with the Chicago Car Heating Co. At that time he presented before the Illinois and Michigan Chapters of the Society a paper on *Railway Passenger Car Heating*, which was published in the 1917 TRANSACTIONS.

E. W. Rietz
Skokie, Ill.

During World War I he served as a second lieutenant with the Aviation Section, Signal Officers Reserve Corps, and was selected to attend an aeronautical engineering course at Massachusetts Institute of Technology. Beginning with Powers Regulator in the specialty division in Chicago, covering engineering and sales, he later transferred to Skokie.

Besides his membership in the Society since 1923, Mr. Rietz is a member of *ASME*. He is a licensed professional engineer in the state of Illinois.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 164 men who are candidates for membership, or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before April 30, 1956, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: †Reinstatement *Advancement

California (*Region* 4)

BOGNER, W. J., Co-Partner, B. & M. Air Balance Co., South Whittier.

BROSE, J. L., Vice Pres., The Brose Co., Oakland.

CLAWSON, R. B., Sales Engr., Durant Insulated Pipe Co., Palo Alto.

GREYSON, R. D., Chief Mech. Engr., Donald R. Warren Co., Los Angeles.

REBARD, E. W., Designer, Cramer Acoustics, San Francisco.

Connecticut (*Region* 1)

DELCAMPO, EDWARD,† Supvsr. A-C. Dept., The Jack Lipman Co., Hartford.

SCRIBNER, G. C., Sales Engr., Tuttle & Bailey, Inc., New Britain.

District of Columbia (*Region* 5)

CHAPPELEAR, J. A., Tech. Promotional Repr., Johnson Service Co., Washington.

MARKS, C. H., Cons. Engr., National Coal Association, Washington.

SHYTLE, D. E., Vice-Pres., Combustion Corp., Washington.

SMITH, W. T., Chief Refrig. & A-C. Section, Hq. U.S. Air Force, Washington.

Georgia (*Region* 5)

CUSHMAN, H. L., Regl. Mgr., Pyle National Co., Atlanta.

TUCK, C. M.,* Dist. Mgr., Reznor Manufacturing Co., Athens.

WEST, W. P.,* Dist. Mgr., Johnson Service Co., Atlanta.

Illinois (*Region* 2)

FRANKS, E. L., Engr.-Designer, H. S. Kaiser Co., Chicago.

GLEASON, J. H., Chief Plant Equipment Design Engr., International Harvester Co., Rock Island.

KAISER, I. B.,* Engr.-Estimator, H. S. Kaiser Co., Chicago.

LOBEL, L. M., Engr.-Designer, H. S. Kaiser Co., Chicago.

NELSON, R. D., Dist. Repr., McDonnell & Miller, Inc., Chicago.

PERLET, A. W., Br. Mgr., The Powers Regulator Co., Peoria Heights.

ROHE, F. H., Dist. Repr., McDonnell & Miller, Inc., Chicago.

STEPHENSON, P. M., Pres. and Gen. Mgr., Aldrich Co., Wyoming.

Indiana (*Region* 2)

JACOBS, S. R., Mech. Engr., Lennox & Matthews & Associate, Inc., Indianapolis.

ZIETLOW, F. P., Mech. Engr., H. C. Gammon Co., Inc., Indianapolis.

Iowa (*Region* 3)

STOVER, R. S.,* Owner, R. S. Stover Co., Marshalltown.

Kansas (*Region* 3)

DUPREE, O. J., Repr., American Blower Corp., Wichita.

FLINNER, A. O., Prof., Kansas State College, Manhattan.

MARTIN, L. R., JR., Sales Engr., Minneapolis-Honeywell Regulator Co., Wichita.

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Kentucky (*Region* 5)

BEELER, L. S., Prod. Supvsr., Reynolds Metals Co., Louisville.

LITKENHOUS, L. E., Mgr. Htg. & A-C. Dept., Zoeller Co., Louisville.

Louisiana (*Region* 5)

BAKER, G. H., Owner, Coleman Sales & Service Co., Baton Rouge.

CABRIAC, H. A., JR., Vice-Pres., Cabriac Mechanical Contractors, Inc., New Orleans.

MCCARTY, M. R., Sales Engr., Johns-Manville Sales Corp., Baton Rouge.

STELLY, J. A., Supvsr., Com. Sales, Gulf States Utilities Co., Baton Rouge.

Louisiana (*Region* 6)

LONGFELLOW, C. D., Engr., Arkansas-Louisiana Gas Co., Shreveport.

WATT, F. W., JR., Mech. Draftsman, Paul O. Rottmann, Cons. Engrs., Shreveport.

Maryland (*Region* 5)

ELLIOTT, R. E., Vice-Pres., J. E. Perkins Corp., Baltimore.

WILLIAMS, T. J., Sales Engr., National-U.S. Radiator Corp., Baltimore.

Massachusetts (*Region* 1)

BRACKETT, R. D., Owner, Brackett Heating & Appliance, Maynard.

COX, G. M., Head of Contract Div., Powers Regulator Co., Boston.

LATIMER, L. C., JR., Owner, L. C. Latimer & Sons, Pittsfield, Mass.

MCCORMICK, W. A., JR., Dist. Mgr., American Blower Corp., Boston.

SWEATLAND, L. R., Owner, L. R. Sweatland, Pittsfield.

Minnesota (*Region* 3)

HAGSTROM, G. G., Indus. Gas Engr., Northern States Power Co., St. Paul.

LIERBOE, L. L., Mech. Engr., Corps of Engineers, U. S. Army, St. Paul.

PALMER, E. P., Mech. Engr., Lang & Raugland, Archts. & Engrs., Minneapolis.

WOLFBERG, H. A., Proj. Engr., York Corp., Minneapolis.

Mississippi (*Region* 5)

ROBICHAUX, N. J., Jr. Engr., United Gas Corp., Jackson.

Missouri (*Region* 3)

ARGO, L. V., Sales Engr., General Electric Co., St. Louis.

CHURCH, T. R., Owner, Church Co., Kansas City.

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Crawford, A. E., Partner, A. E. Crawford & Co., St. Louis.

Gleeson, D. V. B., Appl. Engr., American Furnace Co., St. Louis.

Jett, P. R., Owner, Paul R. Jett Co., St. Louis.

Kuellmer, K. R., Chief Engr., Minneapolis-Honeywell Regulator Co., St. Louis.

Lyons, H. E., Sales Engr., Detroit Controls Corp., St. Louis.

McKenna, F. W., Chief Engr., Kennard Corp., St. Louis.

Munson, A. L., Cons. Engr., A. L. Munson and Associates, Webster Groves.

Roffmann, K. A., Pres., Hemminghaus, Inc., Ferguson.

Staehle, R. W., Dist. Repr., Worthington Corp., Kansas City.

Trahue, J. A., Vice-Pres., B & B Combustion Equipment Co., St. Louis.

Wacaster, H. M., Br. Mgr., Johnson Service Co., St. Louis.

Witte, R. H., Partner, A. E. Crawford & Co., St. Louis.

Montana (*Region* 3)

Anderson, A. T., Secy.-Treas., A. T. Klemens & Son, Great Falls.

Drapes, A. G., Cons. Engr., Great Falls.

Hess, W. J., Archt., Partner, McIver, Hess and Haugsjaa, Great Falls.

Nebraska (*Region* 3)

Abart, G. B., Sales Engr., The Walling Co., Omaha.

Lassek, B. R., Pres., WesCo Supply Co. Inc., Omaha.

New Jersey (*Region* 1)

Boyle, W. M., Market Dvlpt. Sales Supvsr., Minneapolis-Honeywell Regulator Co., Union.

Parker, N. A., Mgr., Parker Sheet Metal Co., Pine Brook.

New Mexico (*Region* 6)

Barnett, B. K., Partner, Herlin Engineering Co., Albuquerque.

New York (*Region* 1)

Greenbaum, Uri, Designer, S. W. Barbanel, Cons. Engr., New York.

Farber, E. K., Proj. Engr., Moore Business Forms, Niagara Falls.

Hayes, J. J., Sales Engr., L. J. Wing Manufacturing Co., New York.

Hecht, Harold, Cons. Engr., New York.

Herman, G. A., Jr., Owner, George A. Herman, Jr., Rochester.

Ober, D. E., Sales Repr., Robert B. Darling Co., New York.

Reid, Lewis, Engr., C. R. Acheson, Cons. Engr., Syracuse.

Siewert, N. R., Pres., Siewert Equipment Co., Rochester.

Srebnick, B. H., Repr., Monogram Electric Products Corp., New York.

Tuttle, B. N., Pres., Air Contracting Co., DeWitt.

Walker, A. D., Jr.,† Pres., A. D. Walker & Co., Inc., New York.

Wopperer, R. U., Secy., Frontier Insulation & Asbestos, Inc., Buffalo.

North Carolina (*Region* 5)

Bass, J. E., Jr., Sales., Johnson Service Co., Charlotte.

Beall, A. J., Jr., Mech. Dept. Supvsr., Charlotte Engineers, Inc., Charlotte.

Foreman, W. T., Jr., Sales., Chet Adams Co., Charlotte.

Kelly, J. L., Sales Engr., Barber-Colman Co., Charlotte.

Levie, L. A., Sales Engr., American Blower Corp., Charlotte.

Price, A. Z., Jr., Sales Engr., C. & H. Distributing Co., Charlotte.

Satterfield, R. L., Engr., Charlotte Engineers, Inc., Charlotte.

Ohio (*Region* 2)

Black, G. W., Jr., Field Technician, Johnson Service Co., Dayton.

Clark, W. A., Project Engr., Armstrong Furnace Co., Columbus.

Dee, V. C.,† Sales Engr., Powers Regulator Co., Cleveland.

Fickes, D. A., Unit Mech. Supt., The Austin Co., Cleveland.

Hughes, L. I., Pres., Kaighin & Hughes, Inc., Toledo.

Kahler, H. A., Jr. Engr., Fosdick and Hilmer, Cons. Engrs., Cincinnati.

Lazor, D. K., Co-op Student, Johnson Service Co., Cincinnati.

Miller, Daniel, Mech. Engr., B. A. Walterman, Cincinnati.

Tepe, H. T., Product Appl. Engr., Herman Nelson Div., American Air Filter Co., Inc., Cincinnati.

Witherspoon, H. V., Head, Refrig. Dept., H. K. Ferguson Co., Cincinnati.

Oklahoma (*Region* 6)

Hardesty, W. L., Vice-Pres., Hardesty Plumbing, Heating & Air Conditioning, Shawnee.

Parker, H. C., Owner, Harold C. Parker Co., Oklahoma City.

Oregon (*Region* 4)

Markman, D. H., Pres., Gen. Mgr., Copenhagen Inc., Portland.

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OBITUARIES

W. H. SEVERNS, PROFESSOR AND AUTHOR, DEAD AT 67

William H. Severns, 67, professor of mechanical engineering, University of Illinois, Urbana, died at his home on January 29 after a prolonged illness. An expert in the heating field, Professor Severns was the author of textbooks on heating and

W. H. Severns

ventilating, and had been on the University of Illinois staff continuously since 1921. A member of the Society for over twenty-two years, he served on the Publication Committee and various other ASHAE committees.

Born in Garnett, Kans., on December 25, 1888, he attended the local high school. From the University of Kansas he received his B. S. in mechanical engineering in 1914 and M.S. in electrical engineering, 1915. His early teaching assignments were with the University of Kansas, Purdue University and New Hampshire College. He first became a member of the University of Illinois staff in 1917 as an instructor, left for a while during 1919-20 to join the University of Wisconsin at Madison as assistant professor of mechanical engineering, and returned to the University of Illinois in the latter capacity. He was elevated to associate professor in 1927 and full professor in 1931.

The well-known text and reference book, *Heating, Ventilating and Air Conditioning*, was written by Professor Severns, and since has been revised in two editions with Prof. J. R. Fellows as co-author. Professor Severns also is co-author of *Steam, Air and Gas Power*, and of a mechanical engineering laboratory manual and numerous magazine articles. A paper by him was published in the 1927 TRANSACTIONS of the Society, and he took part in the discussion of various technical papers of the Society. He was a member of Sigma Xi and Pi Tau Sigma.

Funeral services were held on January 31 and burial was at Woodlawn Cemetery. Professor Severns' survivors are his widow, Mary E.; his sons, William H., Jr., Wilmington, Del., and Robert Lincoln, Kansas City; and two grandchildren, Mathew and Barbara Severns, of Wilmington.

HERBERT G. ANGELO
Denver, Colo.

Word has been received from the Rocky Mountain Chapter of the death of Herbert G. Angelo, partner, Kindle & Angelo Sheet Metal Fabricators, Denver, Colo. Mr. Angelo died of a heart attack in his home on February 7. He would have been 53 years old on March 24.

Born in Denver, Mr. Angelo attended the West Denver High School and later studied at the University of California. During the 1930's he acted as superintendent of a CCC camp and field engineer with the FERA and WPA, designing heating systems and supervising installations in southern Colorado. He was then employed by the Government Quartermaster as a mechanical engineer at Denver, laying out heating and distribution systems for Lowry Field and Fitzsimons General Hospital. Mr. Angelo also worked as foreman of installation of process piping for Johnson & Davis Plumbing and Heating Co., and foreman of installation of heating and refrigeration equipment for

Journal Section

Stearns-Roger Manufacturing Co., both of Denver.

Mr. Angelo was a member of the Elk's Lodge, *Old Timers Baseball Association*, and Foot Printers.

He was buried in Mt. Olivet Cemetery on February 11. Surviving are his widow, Eva Mae; a son, Michael; his mother, Mrs. Birdie Angelo; and a brother, Louis.

HERMAN J. WOEHLKE
Denver, Colorado

Herman J. Woehlke, Rocky Mountain Chapter member, died on January 23, 1956, at the age of 66. Until his retirement two years ago, Mr. Woehlke was manager of the contract department of the Bell Plumbing & Heating Co., Denver, Colo. He had been a member of the Society and the Rocky Mountain Chapter since 1944.

Following his education at Chicago University and Addison Normal, Addison, Ill., Mr. Woehlke started in the teaching profession with the Collover, N.C., Portage, Wisc., and Denver school boards. During World War I he switched to sales work and heating design and layout. He was connected with the Crane-O'Fallon Co. for many years. In 1942 he joined the Pando Plumbing and Heating Co. as partner and manager. He became assistant manager and estimator for Bell Plumbing and Heating Co. the following year.

Mr. Woehlke was buried in Denver on January 31. Surviving are his wife, Esther, and a son and daughter.

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(62 Chapters: 1 Special Branch: 6 Student Branches)

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ARIZONA

Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, W. A. Biddle, 3817 N. 15th Ave. SECY, E. P. Maxwell, 39 W. Adams St.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, J. L. Brown, 212 Terminal Warehouse Bldg. SECY, H. H. Himstedt, 510 E. Third St.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, D. E. McLeod, 2415 Green St. (23). SECY, Herb Duncan, 938 N. Linden Ave., South San Francisco.

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets, 1st Wed. PRES, R. A. Sarro, 5412 Argo Way (21). SECY, M. J. Delavan, 405 Meister Way (19).

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, J. L. McCullough, 1978 S. Los Angeles St. (11). SECY, W. J. Biggar, 6620 Telegraph Rd. (22).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, L. L. DeLong, 2027 S. Washington St. (10). SECY, W. V. Burbank, P.O. Box 840.

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, E. J. Hoagland, 257 Whitney St., Hartford. SECY, J. D. Pierce, 775 Capitol Ave., Hartford.

DISTRICT OF COLUMBIA

Washington: 1935. Hdqrs., Washington, D.C. Meets, 2nd Wed. PRES, W. C. Heamy, Jr., 720 Mills Bldg. (6). SECY, S. H. Robbins, Jr., 2117 M Street, N.W. (7).

GEORGIA

Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd Mon. PRES, T. A. Barrow, Jr., 302 Ponce de Leon Ave., N.E. (8). SECY, J. A. Marshall, 1415 Howell Mill Rd., N.W.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, G. G. Freyder, 72 W. Adams St. (90). SECY, Herbert Kreisman, 117 N. Desplaines St. (6).

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, J. W. Jackson, 1531 N. Pennsylvania St. (2). SECY, G. W. Vogel, 31 E. Georgia St. (4).

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, G. J. Kraai, 907 Sixth Ave. (14). SECY, W. A. Schworm, Physical Plant Dept., Iowa State College, Ames.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, A. B. Newton, 3511 Elmwood Dr. (17). SECY, T. L. Roberts, 2008 S. Parkwood Lane (18).

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, W. M. Pace, 218 Don Allen Rd. (7). SECY, R. B. Duggan, 41 Beechwood Rd., Jeffersonville, Ind.

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, C. S. Woodruff, P.O. Box 358. SECY, A. J. Mayers, Jr., 7732 Goodwood Ave.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, W. B. Martin, Jr., 635 Commercial Pl. (12). SECY, R. K. Goode, 4052 Thalia St. (25).

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, R. S. Segall, 848 River Rd. SECY, A. L. Jones, Jr., 753 Gladstone.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, E. J. Morris, 813 N. Calvert St. (2). SECY, E. J. Dull, 1122 N. Charles St. (1).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, G. D. Fife, 79 Milk St. SECY, R. F. Curry, 80 Ripley St., Newton Centre (59).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, R. E. Cross, 114 Boston Rd. SECY, F. A. Ferraro, 172 Chestnut St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, D. S. Falk, 4864 Woodward Ave. (1). SECY, J. H. Spitzley, 1200 W. Fort St. (26).

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, S. M. Paganelli, 47 N. Division Ave. SECY, B. J. Walter, 333 Fuller Ave., N.E.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, J. S. Locke, 2753 Fourth Ave., S. (8). SECY, F. G. Vogt, 6530 W. Lake St. (16).

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, B. L. Palmer, 1808 N. Mill St. (2). SECY, M. F. Knipp, Jr., 2858 Arbor Hill Dr. (4).

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, A. S. Hurt, Jr., 3601 E. 18th St. (27). SECY, S. C. McCann, 210 W. Tenth St. (5).

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, E. T. Ciucas, 4354 Olive St. SECY, N. J. Hubbuch, Jr., 7020 Cornell, University City (5).

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, T. E. Davis, 4303 Dodge St. SECY, C. A. Faller, 1802 Mason St. (2).

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, C. H. Smith, 2300 N. Stiles St., Linden. SECY, M. C. Christesen, 196 Everett Pl., Englewood.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, H. F. Munn, 419 Granite, N.W. SECY, J. K. James, 4462 Avenida del Sol.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, L. A. Childs, 308 Forest Hill Dr. (6). SECY, Merle Weninger, 230 Goodrich Ave. (5).

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, L. V. Appleby, N. Pearl & Van Woert Sts. (4). SECY, E. J. Mahoney, 45 Colvin Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, Albert Giannini, 385 Madison Ave. (17). SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, C. W. Kaupp, 271 Delaware Ave. (2). SECY, J. P. Guerra, 34 E. Depew Ave. (14).

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, J. A. Rice, 719 E. Worthington Ave. SECY, E. D. Streng, 1115 E. 10th St. (4).

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon., PRES, R. A. Wilson, 2240 N. High St. SECY, T. R. Walker, 182 N. Yale Ave.

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, A. H. Gerdsen, 224 E. Second St. (2). SECY, T. D. Reiley, 1905 Dunlap St. (14).

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, D. E. Tullis, 1720 Parkhill Drive (6). SECY, L. P. Brehm, Jr., 111 S. Broomfield Rd.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, L. C. Burkes, 1792 E. 40th St. SECY, R. A. Urban, Sr., 1740 E. 12th St. (14).

Toledo: 1954. Hdqrs., Toledo. PRES, C. F. Hoffman, 523 Spitzer Bldg. (4). SECY, R. I. Fruth, 1316 Adams St. (2).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, J. R. Patten, 1726 N.W. Fifth (6). SECY, A. C. Shelley, 2946 Nimitz (12).

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3629 S. New Haven.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, W. R. Norte, 2225 N. E. Broadway (12). SECY, G. G. Van Alst, 947 S. E. Market.

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, A. M. Robertson, 1200 Locust St. (7). SECY, J. J. Hucker, 355-C Lancaster Ave., Haverford.

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, C. L. Benn, 420 Blvd. of Allies (19). SECY, E. H. Riesmeyer, Jr., 231-33 Fort Pitt Blvd. (22).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, R. K. Rouse, P.O. Box 3731, Greenville. SECY, B. A. Leppard, P.O. Box 3353, Station A, Greenville.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, John Hilton, II, 4443 Sequoia. SECY, L. V. Eberle, Jr., 1358 Clementina.

TEXAS

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, F. M. Neil, P.O. Box 13197 (19). SECY, A. B. Ullrich, 2520 Huldy St. (19).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, F. B. Frazee, 1013 Riverside Dr., Austin (4). SECY, J. L. Rea, Jr., 300 West 8th St., Austin.

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, J. C. Wharton, P. O. Box 1240. SECY, D. G. Hailey, 3608 Ave. A.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, R. C. Evans, 2549 Wilmington Ave. (6). SECY, G. E. Wright, Jr., Dooly Bldg.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, C. G. Conaway, Jr., 7454 Hank Ave. (5). SECY, E. R. Simpson, Jr., 720 Guy St.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, F. W. Jenkinson, W. 524 Fourth Ave. (4). SECY, J. A. Doyle, W. 3018 Broad.

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, P. I. L. Winsor, 20031 Marine View Dr., S.W. (66). SECY, M. W. McKinstry, 4017 McGilvra St. (2).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, L. J. Rossiter, 231 W. Wisconsin Ave. (3). SECY, R. D. Rodwell, 152 W. Wisconsin Ave. (3).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, Cornelius Van Boeyen, 636 Drake St. (3). SECY, A. C. Martin, 425 W. Second Ave.

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, G. C. Davis, 212 Waverly St. (9). SECY, A. H. Millar, 342 Mandeville St., St. James (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, R. J. Ker, 5000 Namur St. (9). SECY, W. E. Jarvis, P.O. Box 61.

Northern Alberta: 1956. Hdqrs., Edmonton. PRES, W. C. Woods, 13908 116 Ave. SECY, E. K. Cumming, 10249 104 St.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, D. L. Angus, 25 Bayview Wood. SECY, H. R. Roth, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, E. L. Schoenherr, 32 Clarey Ave. (1). SECY, C. W. Watson, 102 Bank St.

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Walter Hausler, Erbstrasse 2, Kusnacht. SECY, L. F. de Bruyn, Muhlebachstrasse 172 (8).

STUDENT BRANCHES

North Carolina State College: 1948. Hdqrs., Raleigh. PRES, R. E. Crawford, 106½ Logan Ct. SECY, S. R. Moore, Box 4317, State College.

Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, D. B. Doucette, Purdue Student Branch, ASHAE, School of Mech. Engrg. SECY, J. W. Deabler, Purdue Student Branch, ASHAE, School of Mech. Engrg.

Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, C. F. Smale, 347 Kennedy Ave. (9). SECY, T. D. Digel, 204 King St., Weston.

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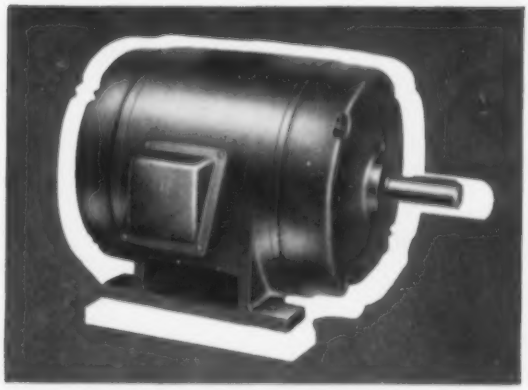

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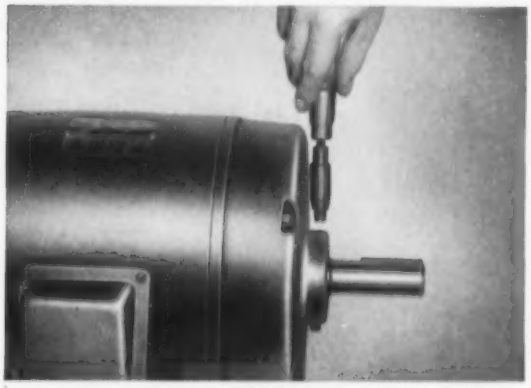

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Heating and cooling on the same day? That's what American Blower air conditioning equipment provides in the new 20-story Great Plains Life Insurance Building, Lubbock, Texas. For, on some days, outdoor temperatures jump from 25° F. in the morning to 82° F. by midafternoon!

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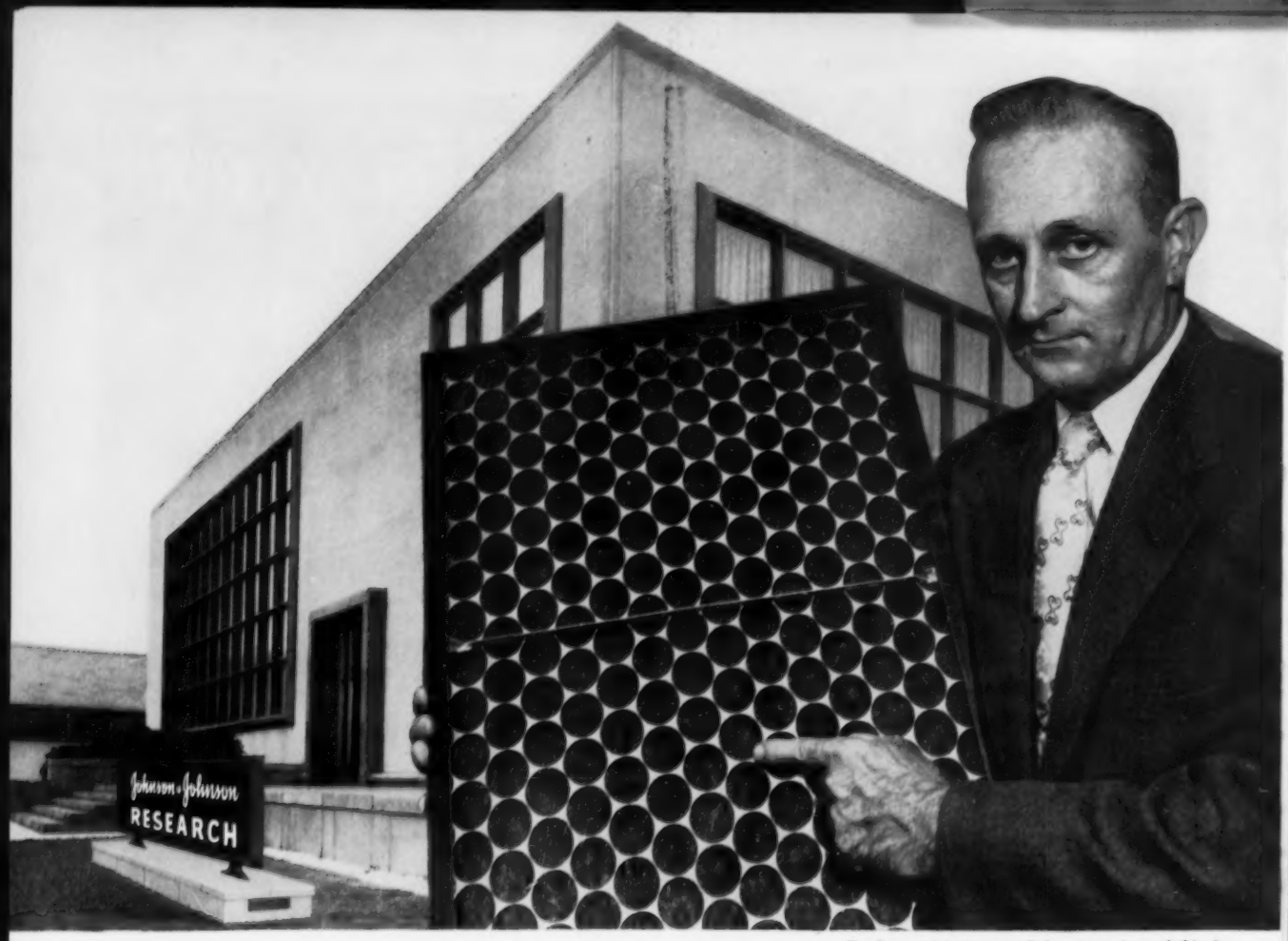


Mr. Bors points to one of the many sizes of Glasfloss Filters used at Johnson and Johnson's research center and other plants and offices in New Brunswick, N.J.

"We like the high efficiency and easy handling of Glasfloss Air Filters"

says Mr. Alexander Bors, Maintenance Supervisor at Johnson & Johnson

In the plant offices of Johnson & Johnson, New Brunswick, New Jersey, employees enjoy exceptionally clean, decontaminated air at minimum costs to the company.

Plant personnel state that the highly efficient filtering action and handling ease of Glasfloss Air Filters have made such results possible. Mr. Charles Sutton, field and maintenance engineer, puts it this way. "After three years of Glasfloss, we are convinced that we have obtained the optimum of filter efficiency and ease of handling . . . more than 90% of the contamination is removed by Glasfloss units . . . an obvious improvement over previously used spun glass filters."

Such results have led the company personnel into planning Glasfloss Filtering for a new surgical dressings research and manufacturing plant now under construction.

What's different about Glasfloss that makes such filtering efficiency possible? First, Glasfloss uses only extremely fine, silky glass fibers that are kind to hands and skin. Lighter-to-heavier density of media from front to back stops surface loading, dust and dirt builds up from the inside out. To you, this means Glasfloss catches more dust and dirt, doesn't hamper the flow of cooled or heated air, lowers maintenance costs. Write for complete information on Glasfloss Filters now, ask for Bulletin DF3. Address your request to Glasfloss Dept., Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

Over 800 tons of refrigeration supply cold water to 20 individual unit conditioners. All fresh and re-circulated air is filtered by Glasfloss in these units at the total rate of 320,000 cfm.

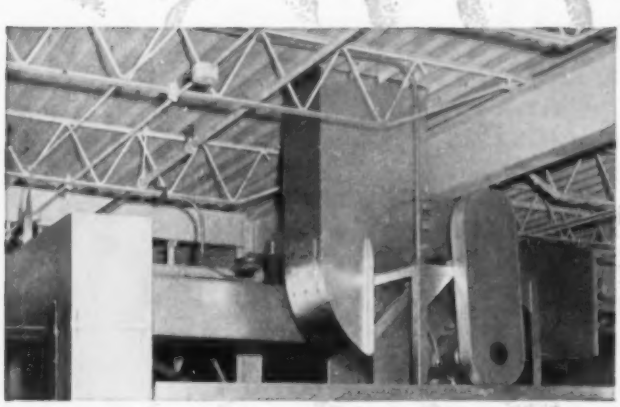
GLASFLOSS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

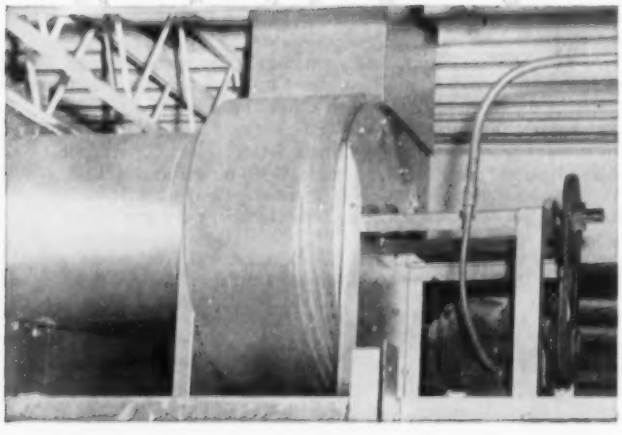
Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY





Heat and Fumes

don't faze these *Specially Engineered* Peerless Blowers!

• Top picture: Peerless 222G Backward Curve Blower exhausts hot air from paint baking oven. Center picture: Peerless 135K Blower circulates hot air in paint drying oven. Bottom picture: Peerless 270L Blower exhausts fumes from paint drying oven. Another Peerless 165F Blower (not shown) in same plant forces hot air into paint baking oven. Operating temperatures: Between 300° to 500° F.

• These four specially-designed and engineered Peerless Blowers operate quietly and efficiently in the finishing department of one of the nation's most modern production plants. They were designed for economical, dependable performance in extreme heat. We can do the same for you. Installations like this are our specialty. Contact us today!

Write, Wire or Phone for Bulletin SDA-160 Today!

FAN AND BLOWER DIVISION

THE *Peerless-Electric*® COMPANY

FANS · BLOWERS · ELECTRIC MOTORS · ELECTRONIC EQUIPMENT

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ening Dispatch

HOME EDITION

ASSOCIATED PRESS NEWS FEATURES, WIREPHOTOS International News Service

T HOME NEWSPAPER

TUESDAY, NOVEMBER 29, 1955

44 Pages

11 Narrowly Escape Death by Monoxide

Fumes Are Backed Up By Cold

Eleven persons, including a mother and her three children, narrowly escaped death Tuesday as the cold wave caused faulty operation of chimneys.

Firemen were called to the home of Mrs. [illegible], 30, of [illegible] Ave. early Tuesday when carbon monoxide filled the home. Firemen said the cold chimney held back the gas fumes and forced them into the house.

Mrs. [illegible] and her children, [illegible], 10, Ernest, 3, and [illegible], 22 months, were administered oxygen on the scene for [illegible] taken to

THIS . . . CAN HAPPEN ANYWHERE!

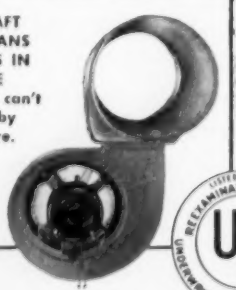
LET **Quickdraft** ASSURE YOU CONSTANT DRAFT FOR COMPLETE COMBUSTION

Because of natural draft troubles, more and more heating plants are operating at low efficiency and spilling combustion gasses into buildings. Intermittent firing makes it all but impossible for ordinary chimneys to handle increased volumes of heavy and cooler by-products of combustion. Better fuels produce more carbon and sulphur dioxides (CO_2 is 55% and SO_2 is 225% heavier than air). Improved furnaces and boilers let less heat escape into chimneys.

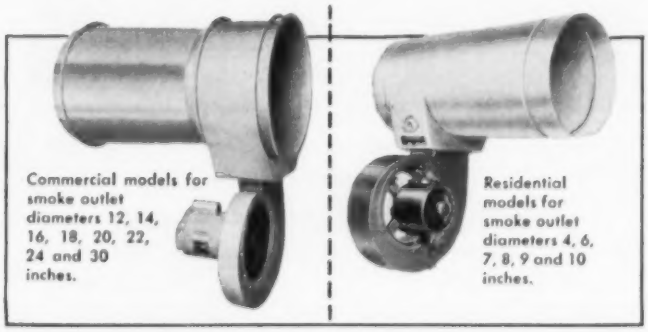
Modern fuels and heating equipment *need full and constant draft.* Turned "on" and "off" automatically with the fire, Quickdraft power draft units prevent noxious concentrations of deadly fumes and dangerous accumulations of explosive gasses from escaping into buildings.

Quickdraft cures heating-plant draft deficiencies . . . without wasting heat to "warm-up" the stack. With or without a chimney, it assures the constant draft required for burning all fuels efficiently and economically. It keeps chimneys dry and eliminates chattering, smoking and sooting. Write today for complete engineering data on the power draft unit that assures complete and economical combustion for health and safety.

POWER DRAFT WITHOUT FANS OR MOTORS IN SMOKE LINE
Exhaust line can't be blocked by power failure.



LISTED UNDER RE-EXAMINATION SERVICE UL UNDERWRITERS' LABORATORIES, INC.



Commercial models for smoke outlet diameters 12, 14, 16, 18, 20, 22, 24 and 30 inches.

Residential models for smoke outlet diameters 4, 6, 7, 8, 9 and 10 inches.

Quickdraft COMPANY
Dueber-Hampden Building
P. O. Box 87-K
Canton 1, Ohio

N-908-QD

Invitation
TO PROFITS!

Arrange now to exhibit at this great biennial panorama of new equipment developments.

13th International Heating & Air-Conditioning Exposition

(formerly the International Heating and Ventilating Exposition)

INTERNATIONAL AMPHITHEATRE — CHICAGO

February 25 - March 1, 1957

Under the Auspices of the American Society of Heating and Air-Conditioning Engineers, and in conjunction with their 63rd annual meeting.

351 Leading Manufacturers

APPLY NOW for information on available exhibit space in the largest exposition of its kind ever held. Facilities are limited, so prompt action is recommended.

have already engaged exhibit space in this Exposition—convincing evidence of its wide recognition as the most outstanding event in the field of heating, ventilating and air conditioning.

WE INVITE progressive manufacturers to participate in this exposition as a means of promoting future sales and profits. There is no more effective method of selling than through first-hand demonstrations.

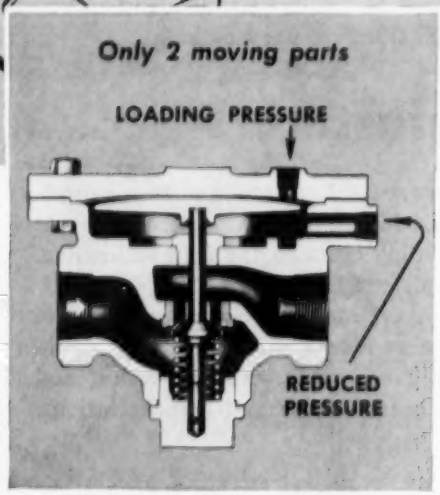
Write NOW to

INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION

480 Lexington Ave., New York 17, N. Y., Phone—PLaza 5-8234

Management: International Exposition Co.

Now Leslie brings you this New NO MAINTENANCE* Reducing Valve



This shows simplicity of Leslie Class G-1 pressure reducing valve.

HERE IS AN AMAZINGLY SIMPLE air loaded, diaphragm operated, pressure reducing valve that is virtually maintenance-free for steam heat or process steam application.

Only two moving parts and no seals, no stuffing boxes, no small dirt-catching parts — practically nothing can get out of order! And a stainless steel hardened main valve with highly polished finish minimizes wear.

This new Leslie valve instantly feels the effect of any flow change and responds to changes as small as 0.1 psi. It can be adjusted easily from minimum to maximum of reduced pressure range from a remote point, even a thousand or more feet away.

This valve is used in steam process and heating lines. And, its uses are unlimited for any steam reductions within body material limits (250 psi, 450°F).

Ask your Leslie engineer to tell you more about this amazing valve. He's listed in your classified directory under "Valves" or "Regulators".

***guaranteed no maintenance for 3 years.**

Send for Bulletin 561 today.

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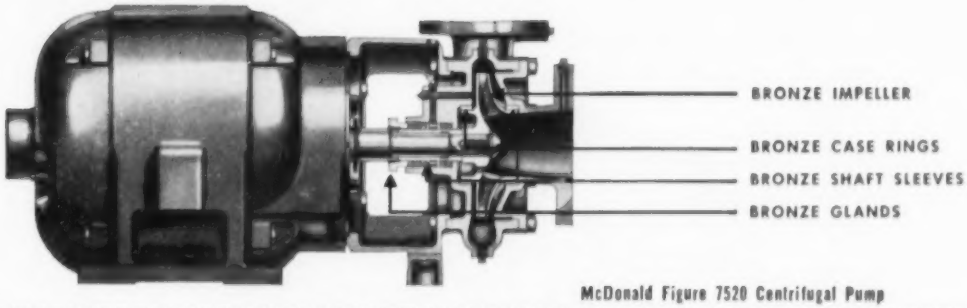
REGULATORS AND CONTROLLERS

LESLIE CO., 237 GRANT AVENUE, LYNDHURST, NEW JERSEY

CONTROLLED QUALITY MEANS QUALITY CONTROLS

EXTRA years of service

McDonald Close-Coupled Centrifugal Pumps Are Fully Bronze Fitted to Last Longer



McDonald Figure 7520 Centrifugal Pump

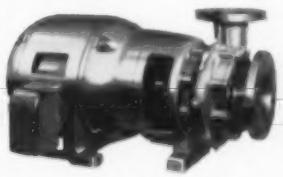
Ideally suited for air conditioning applications, industrial and irrigation uses

These dependable centrifugal pumps are good examples of McDonald quality construction. Impellers, case rings, shaft sleeves and glands are all carefully machined from durable bronze to give your customers extra years of trouble-free service.

You can be sure of top performance, too. The pump is mounted directly on the motor frame, and the impeller on the motor shaft to assure correct alignment under all conditions. The volute is ruggedly built and engineered for correct hydraulic relation. Base design eliminates expensive foundations and requires minimum space. N.E.M.A. close-coupled centrifugal pump motors are used exclusively.

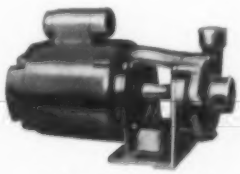
Give your customers extra years of efficient, dependable pump service. Specify McDonald Close-Coupled Centrifugal pumps. Send this coupon today for complete information and prices.

McDonald's 100 years of successful pump designing and manufacturing is your assurance of dependable quality



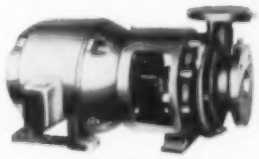
McDonald Figure 7520

High head centrifugal pumps, capacities to 950 G.P.M. Ideal operating range, 280 feet down to 150 feet T.D.H. Sizes 1½" to 4" discharge; motors 2 to 60 H.P.



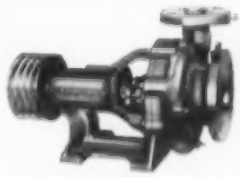
McDonald Figure 7720

Fractional horsepower centrifugal pumps, capacities to 70 G.P.M. Total heads, 20 to 85 feet. Sizes ¾" discharge with ¼ or 1/3 H.P. motors; 1" discharge with ½, ¾ or 1 H.P. motors.



McDonald Figure 7620

Moderate head centrifugal pumps, capacities to 280 G.P.M. Ideal operating range, 150 feet down to 50 feet T.D.H. Sizes 1¼", 1½" and 2" discharge; motors 1 to 10 H.P.



McDonald Belt Driven Units

McDonald close-coupled centrifugal pumps available on frames for belt drive or direct connection with flexible coupling.

A.Y. McDONALD MFG. CO. DUBUQUE, IOWA

PUMPS • BRASS GOODS • OIL EQUIPMENT

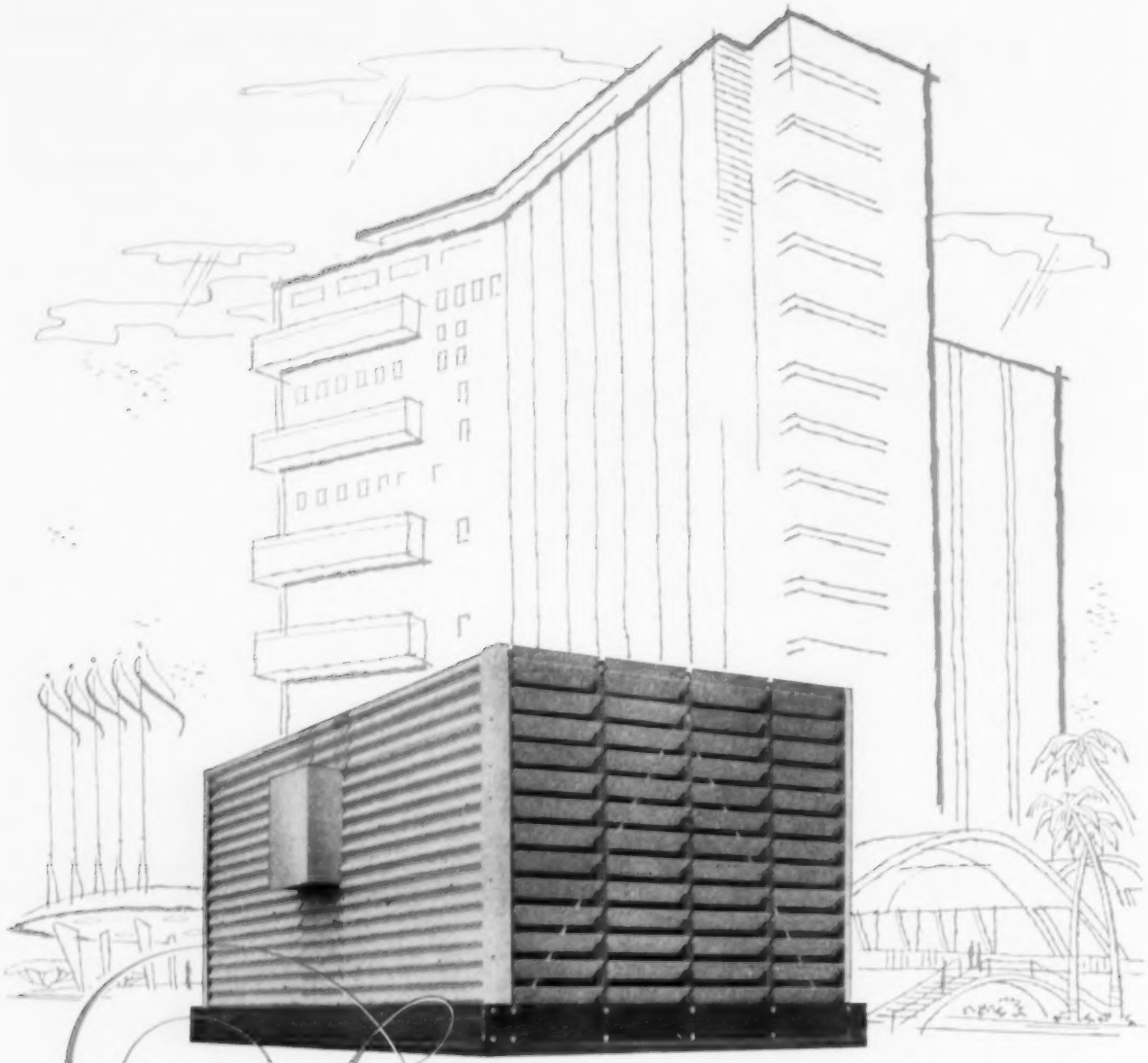
Gentlemen: Please send me information and prices on McDonald Centrifugal Pumps.

Name _____

Firm or Business Name _____

Address _____

City _____ State _____



Distinguished...

This is the Double-Flow Aquatower – **the original** low-silhouette, high-performance cooling tower for major air conditioning installations.

This is the tower so distinguished in design, so conclusively proven in performance, that it has become the overwhelming favorite of architects, engineers, contractors and owners.

This, on a commercial or institutional scale, is water cooling in a class by itself.

*Trademark of **The Marley Company** MARLEY Kansas City, Missouri

MR. PIPE GETS A NEW "WESKIT!"

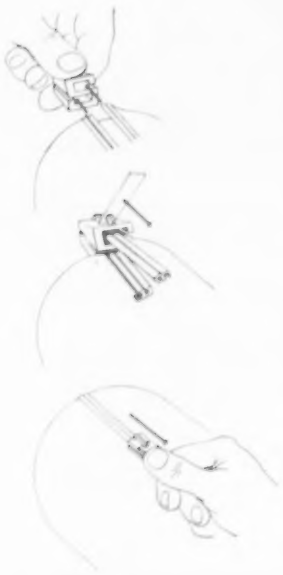
PROTEKTINSUL

MIRACLE PIPE COVERING FINISH

Permanent, watertight, airtight protection for insulation.

Requires no finishing—no maintenance!

Turns, joints and laps spirally wound with Protektinsul Tape, brushed with Vinyl Sealer.



Method of applying Zipper to covering.

PROTEKTINSUL, new thermal insulation pipe and duct covering finish, is a .012" thick, prefabricated, poly-vinyl chloride outer finish that effectively protects insulation against weather, abrasion, chemicals, and mildew. Prefabricated to exact size, PROTEKTINSUL zips on and locks in place, requiring no cutting, fitting, sewing or painting in the field.

Never before a pipe and duct covering finish to give this combination of protection and beauty so important to institutions, hospitals, schools, where cleanliness is such an essential factor. Available in standard colors, or color combinations, for identification.

FREE: PROTEKTINSUL brochure gives you vital information on this unique development for insulated pipe and duct coverings, complete with details, properties, and specifications. Write for your free copy today.

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OWENS-CORNING FIBERGLAS CORP. — JOHNS-MANVILLE INTERNATIONAL CORP.
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Now Herman Nelson brings you years-ahead features in a new "packaged" Unit Blower!

Save time, make specifying easier with ready-to-install Unit Blowers

A Complete Package — And easy to install! You can select a unit to suit your *exact* needs in moments. No separate base layout is needed for motor and fan; no V-belt drive has to be installed and aligned; no separate belt guard or weather protection need be fabricated and installed. No separate parts to figure.

So Easy To Service — For routine servicing, Herman Nelson Unit Blowers are the most *accessible* blowers you can specify or buy. Hinged weather cover always fits; outboard sheave eliminates need for bearing removal when belts replaced. Adjustable motor mounting may be adjusted up or down, or side to side – quickly.

Compact, Space-Saving — You save valuable floor space – can install a trim unit in spaces where more cumbersome equipment would not fit. Weatherproof cover may even be opened vertically where space is limited.

Wide Range of Unit Sizes — Choose from capacities of 370 cfm to 25,000 cfm. New, advanced design models to handle supply and exhaust installations in schools, hospitals, stores, industrial plants, chemical laboratories – anywhere you have a blower application.

Forwardly Curved and Backward Inclined Wheels — Weatherproof cover and belt guard • Inlet side pedestal (all models 12″ up) • Statically and dynamically balanced wheels • Sturdy housings are Bonderite finished to resist rust and corrosion.

NEW

Write for . . . new catalog on Herman Nelson Unit Blowers. Get *all* the facts on ready-to-install "packaged" units designed to simplify your specifying job, save time in installation. Remember, better air is our business, our *only* business for more than thirty years. Address American Air Filter Co., Inc., 373 Central Ave., Louisville 8, Ky.

AAF herman nelson

American Air Filter
COMPANY, INC.
General Offices, Louisville, Ky.
Plants in Louisville, Moline (Ill.), Morrison (Ill.), Chicago and Montreal (Canada)

UNIT HEATERS

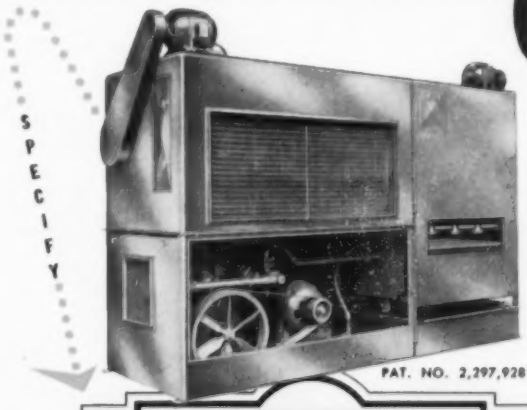
INDUSTRIAL HEATERS

Better Air Is Our Business

CENTRIFUGAL FANS

INDUSTRIAL EXHAUSTERS

If unusual loads or space requirements are your problem...



GOVERNAIR SCU

SELF CONTAINED UNITS

Governair, originators of completely packaged air conditioners, offers you the installation advantage of compact, all-in-one design *combined* with manufacturing flexibility that provides the answer to unusual space and load problems.

Governair's ability to please is further reflected in finer engineering and longer life construction. Write for full details on Governair SCU's!

READY TO OPERATE WITH SIMPLE ELECTRICAL, WATER AND DUCT CONNECTIONS

AIR CONDITIONERS

EVAPORATIVE CONDENSERS

COOLING TOWERS

UNIT COOLERS

BLAST COILS FOR HEATING AND COOLING

GOVERNAIR SCU

GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City, Okla.

A New Approach to Perfection

MAINTENANCE-FREE LIMA MOTORS

IN ALL NEW NEMA FRAME SIZES

- 30% LESS WEIGHT PER HORSEPOWER
- 30% VOLUMETRIC SIZE REDUCTION
- DUAL FANS INTEGRALLY CAST WITH ROTOR
- COMPLETE ROTOR ASSEMBLIES DYNAMICALLY BALANCED
- RIGID, CAST IRON FRAMES WITH INTEGRALLY CAST FEET
- DIAGONALLY SPLIT CAST ALUMINUM CONNECTION BOXES—CADMIUM PLATED COVER SCREWS
- TOTALLY ENCLOSED FRAMES MEET J.I.C. SPECIFICATIONS

Slash maintenance costs and eliminate costly inspection and lubrication programs with Lima Motors in NEW NEMA frame sizes. With lubricated-for-life DOUBLE-WIDTH ball bearings, solid die cast aluminum rotors with dual integral fans, and Mylar insulation . . . Lima gives you higher full-load speeds with the most complete motor protection available. Install these new Finest Quality Lima Motors—and forget them.

Lima now has in production all ratings in new NEMA frame sizes 182 through 326U. Get complete details on Lima's new NEMA *maintenance-free* motors from your Lima Representative now! If he is not already calling on you, his name and address will be found in *Thomas' Register, MacRae's Blue Book* or *Conover-Mast Purchasing Directory*.

Of course, Lima will continue to produce regular NEMA frame sizes 66 to 505 (⅓ to 150 H.P.), incorporating the latest advances in motor design.

THE OLD WAY

Open and unprotected motor bearings subject to contamination and must be inspected and lubricated frequently.

THE LIMA WAY

Sealed and protected—Lima's DOUBLE-WIDTH pre-lubricated motor bearings require no attention—just put the motor to work and forget it.

THE LIMA ELECTRIC MOTOR COMPANY, 4991 Findlay Road Lima, Ohio

Representatives throughout the U. S., Canada and abroad

FIRST . . . FOR MOTORS . . . DRIVES . . . SPEED REDUCERS

The true cost of an expansion joint is not the figure on the manufacturer's price tag. Many factors enter into any such cost determination. For example, an expansion joint that fails just when it shouldn't could wreck a plant and cost a small fortune. And, assuming equal first-cost of any two competitive manufacturers' designs, one that stands up twice as long as the other . . . costs only half as much on a unit-time basis. So, one really shouldn't count on "price" as a measure of value.

But here is one thing you can count on. Every single expansion joint in the Zallea line is designed and built to assure maximum reliability —and top value for your dollar. This is no empty boast, but a fact that can be confirmed for you by figures.

So, whenever you have problems—or needs—relating to expansion joints, don't fail to get in touch with Zallea. Write today for Bulletin 351, containing condensed descriptions of the many types. There is a Zallea joint for every requirement.

Zallea *expansion joints*

ZALLEA BROTHERS, **816** LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

How to Conserve School Budgets with Multiple Heating Units

Packaged gas-fired units provide low-cost, zoned comfort with forced warm air heat.

1. unit room conditioner

The conditioner, sitting on a plenum, is located along an outside wall and backed up to a partition wall. Warm air is discharged from the top outlet grille across the outside wall and windows. Fresh air and recirculation air enters through the floor plenum.

This is a very inexpensive application. If desired, ducts can be extended into adjoining classroom and both rooms heated by one unit.

2. enclosed room conditioner

A deluxe type of installation with the same design features as one above. A ventilated closet completely encloses the conditioner. Combustion air is ducted into closet from outside. This concealed tamper-proof installation is extremely quiet in operation.

3. overhead room conditioner

A Janitrol Horizontal Conditioner is suspended from the ceiling. Warm air is directed parallel to outside walls and across glass areas. A built-in centrifugal blower provides quiet air circulation. This unit is also approved for installation with duct system.

This particular unit requires no floor space and is installed without duct work. Capacities available from 65,000 to 150,000 Btu/hr. inputs.

4. suspended heaters

Small, economical propeller-type heaters are installed overhead in this gymnasium. The small amount of propeller fan noise is not a factor here. An ideal system for intermittent occupancy areas, where installation cost is of prime importance. During unoccupied periods, minimum temperatures can be maintained automatically . . . an advantage common to all these models.

5. central forced warm air system

A heavy duty, forced warm air furnace distributes heat from a central furnace room through a duct system. In larger schools, remote rooms occupied intermittently, and less economically heated by a central system, may be efficiently handled by individual room units.

A central-type system of proven success. Temperature control can be zoned for different activity areas. Furnaces are factory assembled and tested . . . 250,000 to 1,750,000 Btu/hr. input capacities.

MORE INFORMATION ?

These are just a few of the successful installations on file at Janitrol. If you would like additional ideas on low cost installations of Counter-flow Conditioners in perimeter heating systems, or specifications, please write. There's no obligation.

Janitrol

Janitrol Heating & Air Conditioning Division
Surface Combustion Corporation, Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 15

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES AND *Kathabar* HUMIDITY CONDITIONING

THE MARK OF QUALITY

BARBER COLMAN

ELECTRIC-ELECTRONIC

Automatic Controls

22 out of 23 stores in new shopping center choose Barber-Colman Automatic Controls for

better control... electrically
CENTRAL FAN SYSTEMS
UNIT HEATERS
MULTI-ZONE UNITS
PACKAGE AIR CONDITIONERS
. . . all types of conditioned air equipment under one roof! Barber-Colman met these challenges with simpler, faster, more flexible automatic controls.

New Shelbyville Road Plaza Shopping Center, near Louisville, Kentucky

General contractors: Dahlem Construction Company, Louisville
Air Conditioning contractors: The Stewart Distributing Company, Louisville

The new Shelbyville Road Plaza, just out of Louisville, is typical of the fast nationwide trend towards modern merchandising centers. Just as typical is the trend towards electric-electronic control of heating and air conditioning. With electricity, you get instantaneous action, and true positive positioning control. Join the trend to "better control . . . electrically."

Barber-Colman Company

DEPT. D, 1301 ROCK ST., ROCKFORD, ILLINOIS, U. S. A.
Field Offices in principal cities

THE NEW UNARCO DYNA-PAC

...FEATURING BOTH ECONOMY AND EFFICIENT LONG LIFE

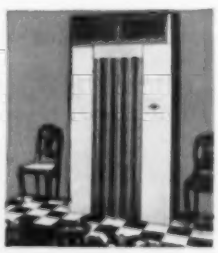
- **2-, 3-, 5-ton capacities in water-cooled or air-cooled models**
- **For residential and commercial installations**
- **Selective manual humidity control**
- **Built-in plenum**
- **4-way adjustable top air discharge on free blow models**

The all-new UNARCO Dyna-Pac meets the challenge of better air conditioning at lower cost. What's more, it was designed with the installing contractor in mind. All Dyna-Pac units are pre-wired and pre-piped for easy, low-cost installation.

There is economy in both the low initial cost and minimum maintenance required. There is also economy of space with the compactly designed DYNA-PAC. Duct models can be attached to existing warm air heating systems to provide year 'round conditioning.

Write Dept. HP-105C for full information, including catalog and prices.

UNION ASBESTOS & RUBBER COMPANY
332 South Michigan Avenue, Chicago 4, Illinois



The Royal-Aire—by UNARCO—representing the ultimate in packaged air conditioning equipment. Available in 5 models, 3 through 15 h.p.

UNARCO

PACKAGED AIR CONDITIONERS

HAVE YOU ENROLLED IN UNARCO'S DEALER PLU$ PLAN? WRITE NOW FOR FULL DETAILS OF BIG DEALER AWARD PROGRAM.

ELIMINATE YOUR HEATING PUMP PROBLEMS—FOR GOOD!

call in a Skidmore Specialist

There's no need for heating engineers, architects or contractors to worry these days — they know the record of performance and continuous service of Skidmore Pumps throughout the years — they know that from this one source (The Skidmore Heating Pump Specialist) you can get experienced council on every type of pump installation. Tailored to your specific needs — you eliminate your pump problems "for good". There's a Skidmore Specialist in every principal city — call him today!

TYPE VC — SINGLE UNIT

The Skidmore Type VC Condensation Pump and Receiver has low inlet connection . . . operates quietly . . . impeller is bronze centrifugal enclosed type. Especially designed for handling hot condensate, entire unit can be removed for inspection or repair without disturbing piping connections. Skidmore Pumps are furnished in either single or duplex type according to installation requirements.

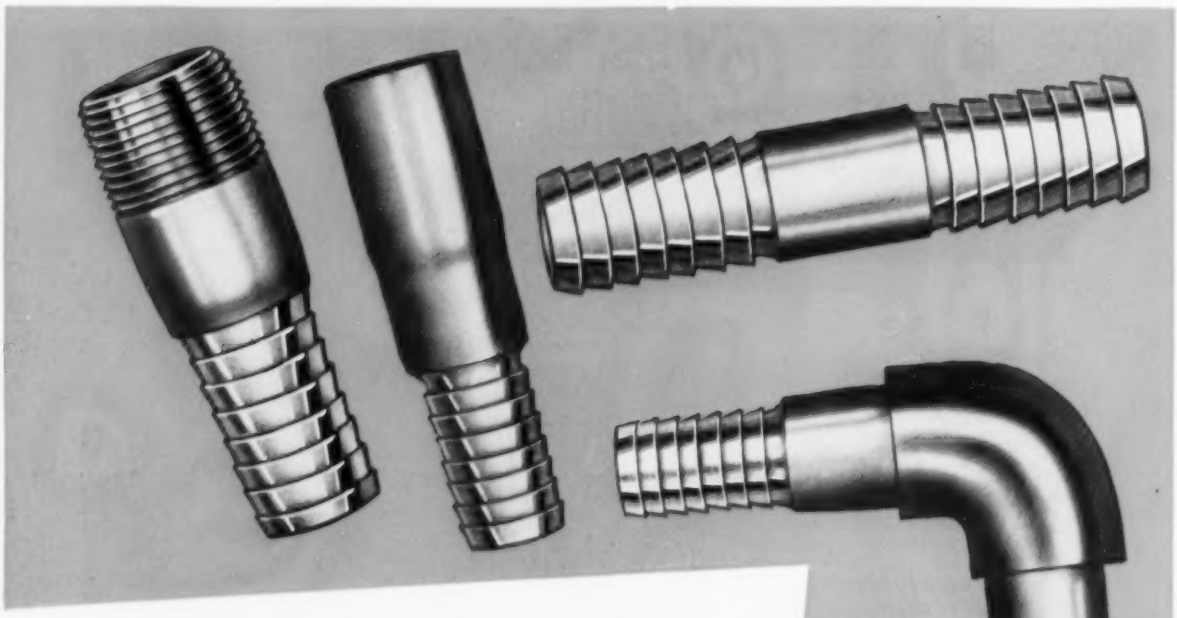
For complete information write for SKIDMORE VC Bulletin No. 10-B.

TYPE UV CONDENSATION PUMP

Where returns are too low to permit the operation of horizontal type pumps — the Skidmore UV Pump performs very satisfactorily. Consists of vertical pump and motor unit with float and float switch mechanism mounted on sump type receiver unit. Write for Bulletin No. 19-B.

TYPE "UV" SINGLE UNIT

SKIDMORE PUMPS — SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

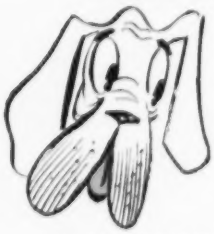


You get lasting, leak-proof joints with U-Brand metal insert fittings for plastic pipe

U-Brand metal inserts assure perfect fit for maximum permanence in your plastic pipe installations. This is especially important in well-pump installations where there's a surge on the line.

All U-Brand inserts provide an extra long serrated surface for clamping security. Raised serrations become firmly embedded in constricted pipe walls for secure grip.

U-Brand insert fittings are available in brass, zinc-plated malleable iron, and steel. There's a shape and size for your every need.



Remember, for your protection, each U-Brand fitting is individually inspected. Whether you buy, sell or install pipe fittings, you'll find that U-Brand quality helps build reputation as well as profits.

A SINGLE SOURCE FOR ALL YOUR PIPE FITTING NEEDS

Galvanized and Black U-Cote Malleable Iron Pipe Fittings—Unions—Plugs and Bushings—Cast Iron Drainage and Screwed Fittings—Steel Nipples and Couplings—Insert Fittings for Plastic Pipe.

U BRAND

The Union Malleable Manufacturing Company
Ashland, Ohio

Fits like a glove

PETRO firing unit with everything built in, balanced and factory tested

Phantomed area shows the Petro package unit (assembled at factory on its own base) fitted to boiler front. Refractory burner throat is part of the burner—no brick work or tile required.

The PETRO package includes an oil or gas burner *(or combined gas-oil)*; a factory-wired control panel; forced draft air supply and a built-in fuel system—ALL IN A SINGLE INTEGRATED UNIT

This is not a simple conversion burner—it's a complete combustion system. Everything that goes into an ultra-modern firing system is right here, mounted on a rigid steel frame and ready to go. All of the intricate wiring and electrical controls are factory assembled, installed, and tested. Every component is engineered for the job, in the proper size, capacity, and type. Nothing is left to on-the-job improvising.

And best of all from *your* standpoint, a single unit means single responsibility. It's a Petro job from beginning to end and Petro is proud to back it up. It has all the sturdy qualities that have made Petro famous for DEPENDABILITY.

The Petro forced draft burner is suitable for firing all types of boilers, or can be purchased as a complete boiler-burner unit with matched Scotch type Titusville or Kewanee boiler.

Coupon will bring full information and specifications.

PETRO

T.M. REG. U.S. PAT. OFF.

PETRO 5227 West 106th Street, Cleveland 11, Ohio.
In Canada, 2251 Bloor Street West, Toronto, Ontario.

Please send me literature and specification sheets on the money-saving Petro Package Unit.

Name_____

Company_____

Address_____

City_____ State_____

Congratulations to Macon, Georgia on its radiant heated Junior High School for Girls

The little Red Schoolhouse

...aint what she used to be!

Albany, Georgia keeps pace with radiant heated Isabella Heights School

Memories of the little red schoolhouse and the heart-tugging refrain "school days, school days, good old golden rule days" are fine . . . sentimentally. Practically, we Americans have too much concern for the health and welfare of our children to really want to return to the era of the wood stove and kerosene lamp. The hickory stick . . . maybe . . . but not the others!

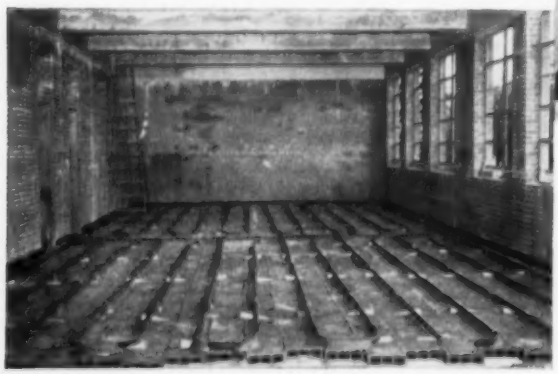
We take pride in the finest school buildings in the world because we know that the education of our children is the most *important* thing in the world . . . basic to American progress. So we're not "soft," just realistic, in providing the best light, heat, sanitation and recreational facilities possible. Healthy children learn more, faster.

All over the country new schools are incorporating radiant heating because its gentle, all-permeating, sun-like warmth . . . without hot or cold spots, drafts, or dust laden currents . . . provides the most healthful school heating known. Concealed heat sources and controls resist vandalism, promote safety, save valuable floor and wall space and improve classroom appearance. Auditoriums and gymnasiums (even swimming pools!) derive particular benefit.

Steel pipe is, of course, first choice for radiant heating as it is for conventional heating . . . proved in more than 60 years of service in steam and hot water systems. In fact steel pipe is the most widely used pipe in the world, for heating, plumbing, snow melting, fire sprinkler systems and the transmission of power, steam and air.

Beautiful Lakeview School, Vass, N. Carolina will be comfortable, too, with radiant heating

Typical installation in modern schoolroom



Washington - Douglass Elementary School, Jackson, Tenn., looks as modern as its radiant heating

Send for free 48 page color booklet "Radiant Panel Heating with Steel Pipe" and 32 page companion booklet "Steel Pipe Snow Melting and Ice Removal Systems."

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N. Y.

Steel Pipe is First Choice

McQuay

WATER COOLING COILS PROVIDE 2800 TONS OF AIR CONDITIONING for The HIGBEE Company

FAMOUS CLEVELAND STORE

Piping-Air Conditioning Contractor:
Ray A. Wise & Co., Cleveland, Ohio

Sheet Metal-Air Conditioning Contractor:
John C. Boehm Co., Cleveland, Ohio

Ruggedness and efficiency were the determining factors in the selection of McQuay Ripple-Fin Coils to provide Cleveland's famous Higbee Department Store with 2,800 tons of air conditioning. McQuay Heating Coils also supply the necessary heating requirements.

Ripple-Fin construction, an exclusive feature of McQuay Coils, produces a ripple air flow pattern assuring a closer and longer contact between the air stream and the coil surface, thereby preventing air by-pass and producing more rapid heat transfer. They have higher flexible strength with minimum air friction and cleaner operation.

McQuay Coils are available in a wide variety of styles and sizes; both standard and special coils for steam, hot water, cold water, brine, direct expansion, refrigerant condensing and other applications.

McQuay INC.

AIR CONDITIONING
HEATING
REFRIGERATION

REPRESENTATIVES IN PRINCIPAL CITIES OR WRITE McQUAY, INC., 1601 BROADWAY NORTHEAST, MINNEAPOLIS 13, MINNESOTA

Get the jump on competition with...

..for the heart of your air conditioner

It's a little like having aces wired, when a Copelaweld motor-compressor is a part of your packaged air conditioner. You've the comfortable feeling of being a step ahead of your competition.

The quiet purr of a Copelaweld delivers up to 10% more capacity than similar types . . . and at lower power consumption. The heavy-duty, high power factor motor combines valuable efficiency and operating economy.

Every Copelaweld feature is a selling point for your air conditioner. These are statements you will make with pride . . . sound, one-piece casting positively aligns motor and bearings . . . counter-balanced crankshaft for smoothness . . . positive lubrication from an oil pump with no moving parts . . . solid bronze rods and bearings for long life . . . Swedish steel valve reeds for precision compression control . . . compact to minimize space required.

Those are facts you'll use to build sales for your air conditioner when you use Copelaweld motor-compressors.

FREON-12 and FREON-22 MODELS AVAILABLE

½, ¾ and 1 H.P. models using Freon-12; ½, ¾, 1 and 1½ H.P. models using Freon-22. For larger capacities "Dual Copelaweld" systems offer such advantages as less cycling; lower starting current; flexibility . . . often at cost comparable to a single, larger motor-compressor.

SEND FOR PERFORMANCE DATA AND COSTS

SINCE 1918

Copeland
REFRIGERATION CORPORATION, Sidney, Ohio

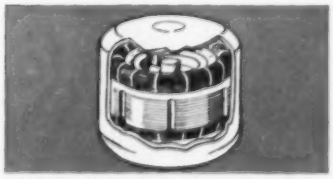
. . . make installation easier, cut costs

Install a blower with a Delco Products direct drive motor on your next blower job. This simplified blower design with fewer moving parts makes possible a more compact, lighter weight installation requiring less maintenance. Best of all, it costs less.

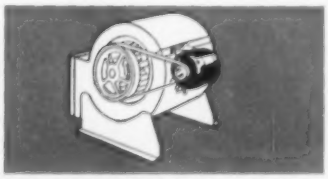
You can get direct drive blowers equipped with four different basic types of Delco Products motors: shaded pole, extended winding, permanent split-capacitor, and split-phase. In this wide selection of designs and models there is a motor to meet every application and power requirement.

Every blower powered by a Delco Products direct drive blower motor has been carefully engineered by both Delco Products and the blower manufacturer to give long life and economical operation. Delco Products maintains service stations from coast to coast and throughout the world for quick, competent, reliable service.

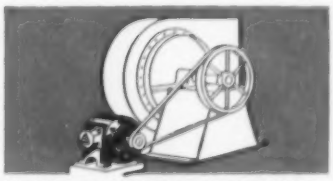
For assistance on any motor problem, contact your nearby Delco Products Sales Office or Delco Products, Dayton, Ohio.



DELCO PRODUCTS HERMETIC MOTORS for refrigeration compressors. Four-pole models, 1/12 to 10 h.p. Two-pole models, 1/8 through 15 h.p.



DELCO PRODUCTS BELT DRIVE MOTORS. Split-phase, capacitor-start, and polyphase fhp models for fans, blowers and compressors.



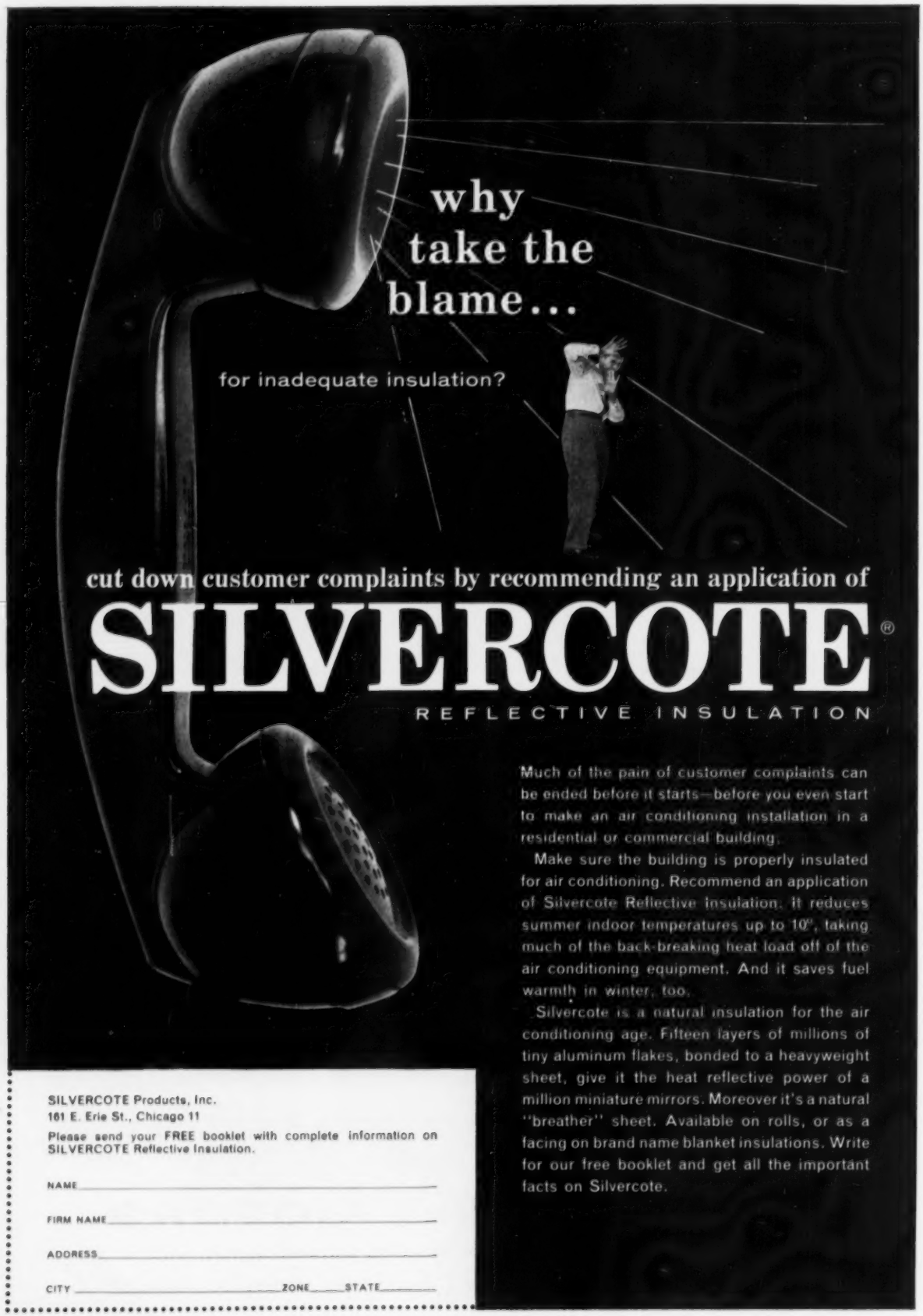
DELCO PRODUCTS POLYPHASE INTEGRAL HP MOTORS in rerated NEMA frames now provide more power per pound.

GM GENERAL MOTORS DELCO DAYTON OHIO

DELCO *Electric* MOTORS

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS, DAYTON, OHIO

Proved best by Performance!



cut down customer complaints by recommending an application of

SILVERCOTE®

REFLECTIVE INSULATION

Much of the pain of customer complaints can be ended before it starts—before you even start to make an air conditioning installation in a residential or commercial building.

Make sure the building is properly insulated for air conditioning. Recommend an application of Silvercote Reflective Insulation. It reduces summer indoor temperatures up to 10°, taking much of the back-breaking heat load off of the air conditioning equipment. And it saves fuel warmth in winter, too.

Silvercote is a natural insulation for the air conditioning age. Fifteen layers of millions of tiny aluminum flakes, bonded to a heavyweight sheet, give it the heat reflective power of a million miniature mirrors. Moreover it's a natural "breather" sheet. Available on rolls, or as a facing on brand name blanket insulations. Write for our free booklet and get all the important facts on Silvercote.

SILVERCOTE Products, Inc.
161 E. Erie St., Chicago 11

Please send your FREE booklet with complete information on SILVERCOTE Reflective Insulation.

NAME_____

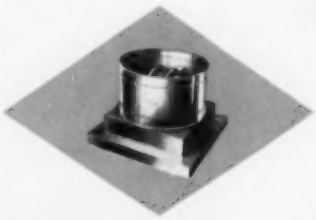
FIRM NAME_____

ADDRESS_____

CITY _____ ZONE____ STATE_____

Type PRV—Centrifugal Fan
For roof exhaust of duct systems with static pressures up to 2½". Direct-connected backward curved fan. Air deliveries from 220 to 25,000 cfm.

NEW **Type LSQ—Propeller Fan**
Low silhouette and high efficiency with direct-connected vertical propeller fan and all-aluminum housing. Provides quiet, dependable ventilation.

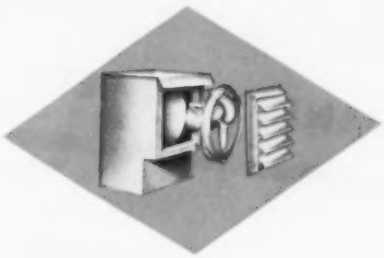


Type SB—Propeller Fan
High speed, high air capacity for up-blast exhaust ventilation in industrial applications where noise levels are not critical.

Type RVS—Centrifugal Fan
Used widely over duct or flue connections where small or moderate air capacities at static pressures up to ½ inch are involved.

"TOP" VENTILATION

. . . for your buildings with ILG Power Roof Ventilators



Penthouse Type —Propeller Fan
Maximum air volume capacity for free air exhaust. Ideal for removing air laden with steam, moisture, smoke or fumes.

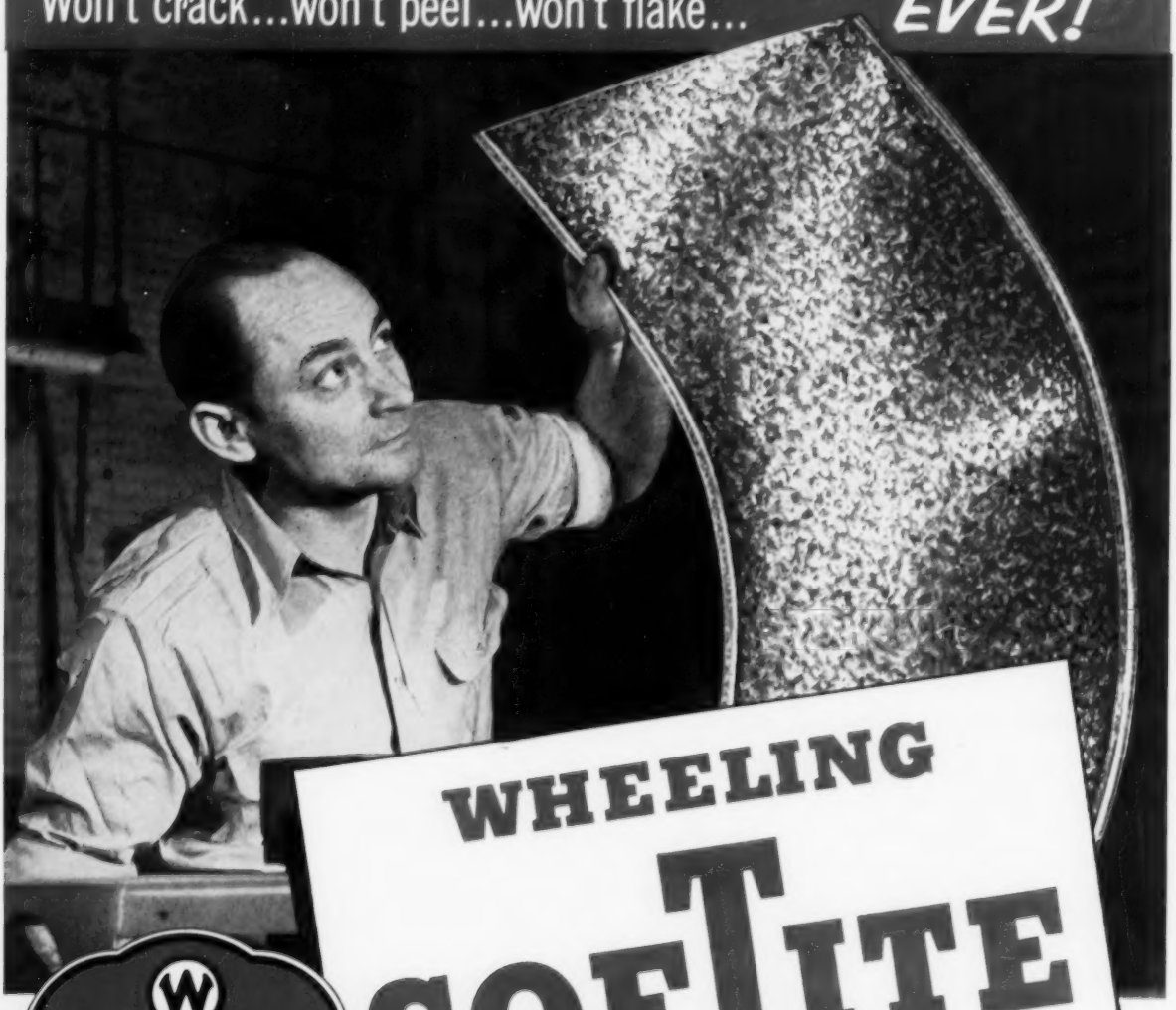
Here's the "top," complete line of power roof ventilators. Designed to meet specific architectural requirements, ILG units are ideal for tough ventilation problems encountered in schools, hotels, apartment buildings, stores and factories, large or small.

They provide positive, controlled, all-weather ventilation. Ilg Power Roof Ventilators give top efficiency in exhausting air that is heavily laden with steam or moisture, smoke or fumes. Simple, functional design makes installation easy. Maintenance is no problem because direct-connected Ilg design eliminates pulleys and belts which ordinarily require periodic adjustment and replacement.

ILG
50TH ANNIVERSARY
1906-1956

ILG ELECTRIC VENTILATING COMPANY
2850 North Pulaski Road, Chicago 41, Illinois

Won't crack...won't peel...won't flake... EVER!



WHEELING

SOFTITE®

COP-R-LOY® GALVANIZED SHEETS

Wheeling

This is Wheeling's Richmond warehouse. Other Wheeling warehouses and sales offices are strategically located throughout the country. They all offer immediate delivery of warehouse-stocked Wheeling items such as SofTite Cop-R-Loy Galvanized sheets, Galvanized Furnace Pipe, snap lock or closed seam Perimeter Heating or Air Conditioning Pipe, and accessories.

Here's a galvanized sheet that can really be *worked* with never any fear of chipping or flaking. Why? Because it's ductile and tight coated, made on Wheeling's new continuous galvanizing line. Bead it, seam it, fold it . . . do anything you like . . . this coating will go anywhere, do anything the base metal will!

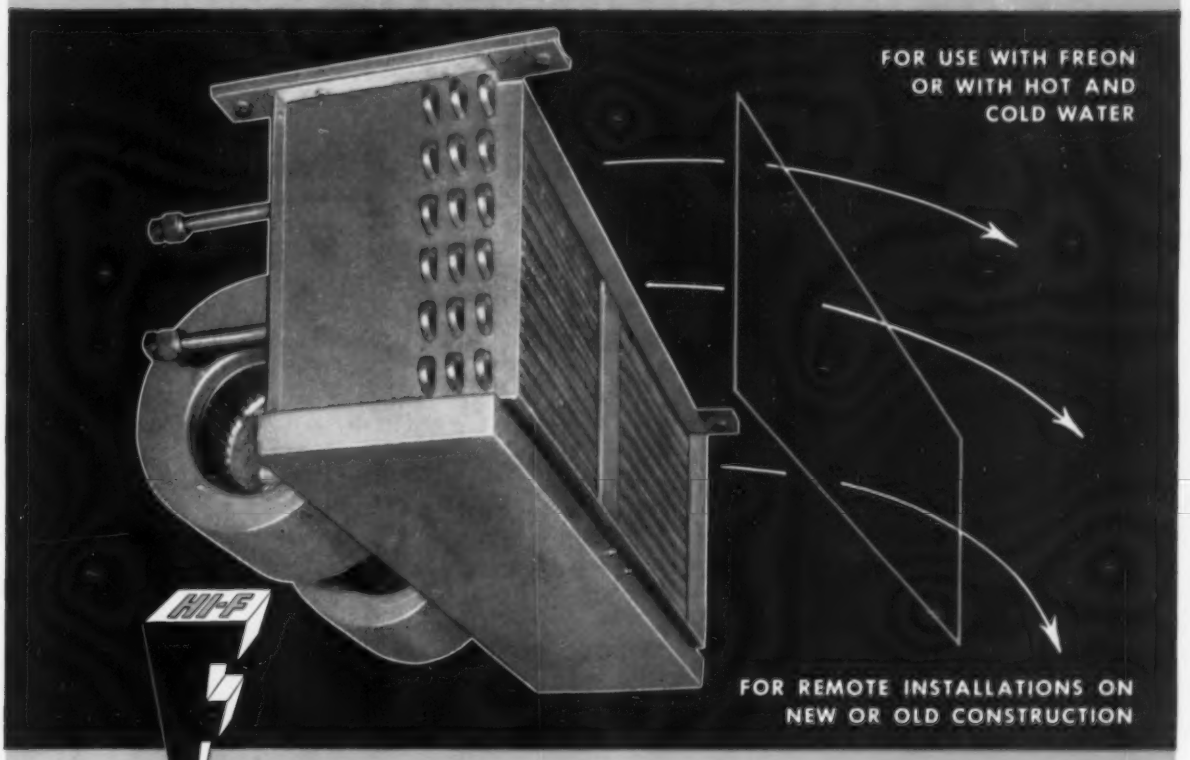
As a result, Wheeling SofTite Cop-R-Loy Galvanized Sheets give tighter joints, surer seams, longer spans. They make every job look better, last longer. Remember SofTite next time you order galvanized sheets. That's SofTite, made only by Wheeling. Get full details from the Wheeling warehouse or sales office nearest you!

WHEELING CORRUGATING COMPANY, WHEELING, WEST VIRGINIA

Warehouses: Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Minneapolis, New Orleans, New York, Philadelphia, Richmond, St. Louis. **Sales Offices:** Atlanta, Houston.

CONCEAL-X

THE NEW AIR CONDITIONING UNIT THAT REQUIRES NO FLOOR SPACE



for
MOTELS
HOTELS
HOMES
OFFICES
HOSPITALS
and
General Buildings

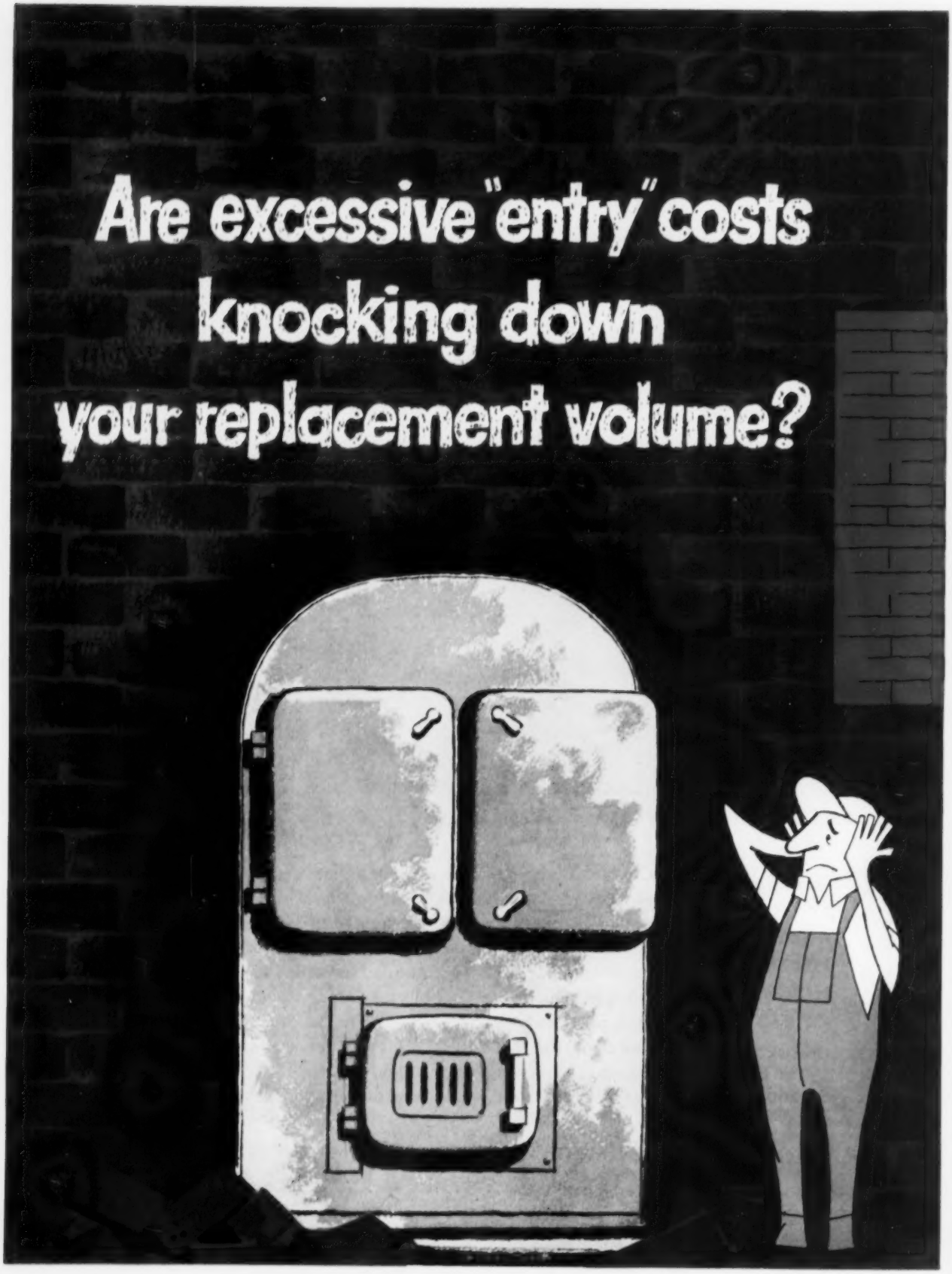
Conceal-X is built to save you money, make you money, and to better satisfy your customer. It is a real space saver designed for use in out of the way places and with the capacity to do a big job *quietly*. Recommended for motels, dwellings and buildings for Winter-Summer air conditioning. Conceal-X, installed in vestibules, overhead entrance ways, plenums, closets or hallways with or without false or furred ceilings, provides horizontal discharge to one or several adjacent rooms. Best of all, Conceal-X incorporates the Peerless patent-applied-for Hi-F finned construction that gives you greater B.T.U. efficiency year after year. May we send you bulletin and specifications?

PEERLESS OF AMERICA, INC.

MANUFACTURERS OF REFRIGERATION AND AIR CONDITIONING COILS SINCE 1912

Dept. H, 5830 N. PULASKI ROAD, CHICAGO 30, ILL., U.S.A.

Are excessive "entry" costs knocking down your replacement volume?



Think how many customers in your area would replace worn-out boilers if it weren't for excessive installation costs. *You can get these jobs* if you

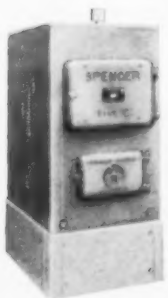
install the unique

SPENCER "LW"

BUILT IN TWO SECTIONS—permits easier entry through narrow basement openings. Avoids costly tearing out of walls. The two water-tight sections can be moved in separately, yet require no welding for installation.

LOWER WATERLINE—overall height of the Spencer "LW" is approximately 25% less than that of conventional firebox boilers...makes possible its use in low-ceilinged basements...saves excavation expense!

LET SPENCER BUILD UP YOUR BOILER BUSINESS — WRITE DEPT. HP-46.



New Spencer "C". Heavy-duty commercial boiler performance at a residential boiler price! Can be fired with oil, gas or coal.

Spencer "A". Complete range of sizes from 3,500 to 50,000 sq. ft. steam, net SBI ratings. For *every* building... for *every* fuel.

SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO PENNSYLVANIA

ASME and SBI Approved.

JENKINS PRACTICAL PIPING LAYOUTS

77

Code	Quan.	Jenkins Valve	Service
A	1	Fig. 677A Br. Gate	Cold water well shutoff valve
B	2	Fig. 295 Br. Sw. Check	Prevent backflow thru well pumps
C	1	Fig. 677A Br. Gate	Warm water well shutoff valve
D	6	Fig. 368 Br. Gate	Circ. pump shutoff valves
E	1	Fig. 106A Br. Globe	Settling Tank drain valve
F	1	Fig. 368 Br. Gate	Shutoff discharge to warm water well
G	1	Fig. 368 Br. Gate	Control water to evaporator
H	1	Fig. 368 Br. Gate	Control water to condenser
J	1	Fig. 368 Br. Gate	Control water to warm water well
K	1	Fig. 368 Br. Gate	Control water to ch. water pump
L	1	Fig. 106A Br. Globe	Constant head regulator bypass
M	2	Fig. 368 Br. Gate	Constant head regulator shutoff
N	2	Fig. 352 Br. Sw. Ch.	Prevent backflow thru circ. pumps
P	2	Fig. 368 Br. Gate	Ch. water temp. regulator shutoff
R	1	Fig. 106A Br. Globe	Ch. water temp. regulator bypass
S	2	Fig. 368 Br. Gate	Evaporator shutoff
T	1	Fig. 352 Br. Sw. Check	Prevent backflow thru evaporator
U	1	Fig. 368 Br. Gate	Shutoff water to recovery & precon coil
V	1	Fig. 368 Br. Gate	Shutoff discharge to cold water well
W	1	Fig. 368 Br. Gate	Control water to hot water pump
X	1	Fig. 368 Br. Gate	Shutoff water to heating coil
Y	1	Fig. 368 Br. Gate	Control water to hot water pump
Z	1	Fig. 368 Br. Gate	Control water to ch. water pump
AA	1	Fig. 368 Br. Gate	Control water to warm water well
BB	2	Fig. 368 Br. Gate	Condenser shutoff
CC	1	Fig. 47 Br. Gate	Expansion tank shutoff valve
DD	1	Fig. 47 Br. Gate	Expansion tank shutoff valve
EE	1	Fig. 47 Br. Gate	Control makeup to expansion tank
FF	1	Fig. 92 Br. Sw. Check	Prevent backflow to water lines
GG	8	Fig. 106A Br. Globe	Drain valves

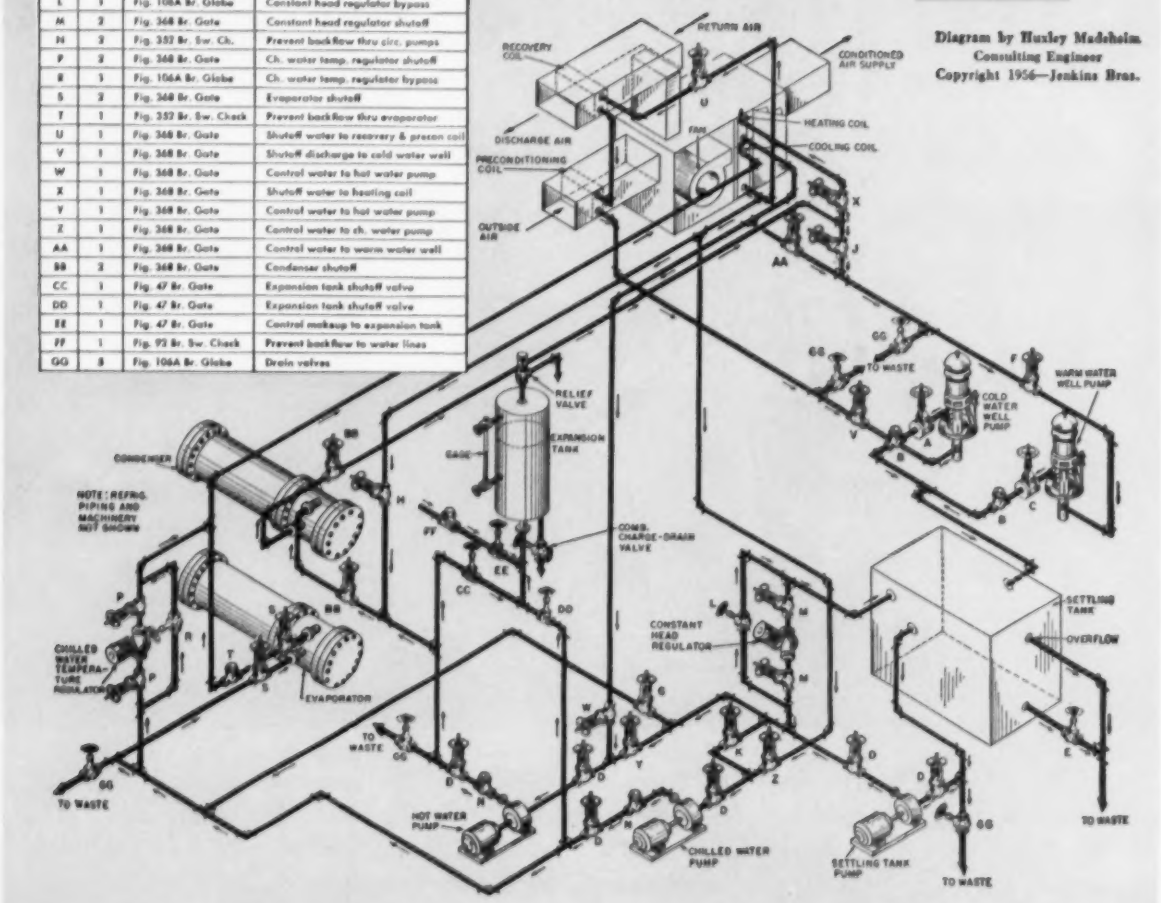


Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1956—Jenkins Bros.

How to plan piping connections for all-year

AIR CONDITIONING WITH THE HEAT PUMP

Well water is used in the basic heat pump installation illustrated. Such a system could readily serve a building with several exterior and interior zones, which would have many air handling units. For simplicity, only one unit is shown in the diagram.

For heating demands, this system provides a closed circuit consisting of hot water pump, condenser, and heating coil. For cooling, a second closed circuit consists of chilled water pump, evaporator, and cooling coil.

During the heating season, water is supplied to the settling tank from the warm water well (about 60° F). It is circulated by the chilled water pump to the evaporator, and then to the cooling coil to provide cooling, where needed, for interior areas. The water then flows to the recovery coil, picks up heat from waste air and carries it to preconditioning coil, where it is used to preheat outside air. The resulting chilled water is discharged to the cold water well.

During the intermediate seasons, water is supplied to the settling tank from the cold water well (about 50° F). It is circulated by the hot water pump to the condenser, and then to the heating coil to provide heat, where needed, for the exterior zones. The water is then discharged to the hot water well.

During the cooling season, water from the cold water well is pumped to the settling tank, and then circulated to the evaporator and the cooling coils. It is next used to cool the condenser, and is then discharged to the hot water well. If the demand for cooling is low, and the well water cold enough, the evaporator may be bypassed.

Consultation with accredited piping engineers and contractors is recommended when planning major piping installations.

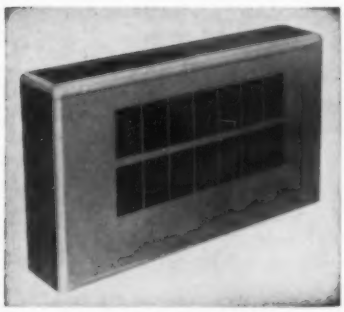
Enlarged diagram and full description of this layout free on request. Ask for Layout No. 77. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS VALVES
LOOK FOR THE JENKINS DIAMOND

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

EQUIPMENT DEVELOPMENTS . . .

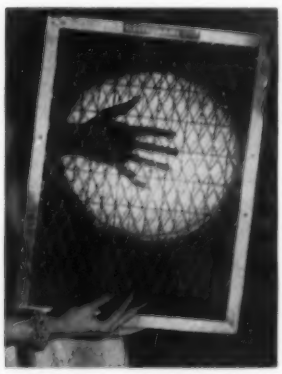
For reviews of Recent Trade Literature see Page 244



Room Air Conditioner . . .

. . . for high pressure air conditioning installations—*Trane Co., Dept. HPAC, La Crosse, Wis.*

"Induction UniTrane" designed for perimeter zone cooling, heating in induction type air conditioning system. Cited features: tandem arrangement of jets in nozzle plate to provide multistage induction of secondary air; filtering of primary and secondary air before it is diffused to conditioned area. In vertical cabinet and vertical concealed models.



Air Filter. . .

. . .for "lifetime" use—*Hadley Products Co. Inc., Dept. HPAC, Marietta, Ohio.*

"Electronaire" electrostatic filters are washed rather than replaced. Filter pack material is said to have electrostatic attraction, to be impervious to acids, liquids, gases, chemicals. Unit is designed for use for life of heating unit into which installed.

Submersible Pump . . .

. . .for 40 to 60 ft water levels—*Lancaster Pump and Mfg. Co., Inc., Dept. HPAC, Manheim Rd., Lancaster, Pa.*

New 1/3 hp model has all bronze construction, stainless steel shaft. Designed for quiet operation. Other sizes to 360 hp, capacities to 8000 gpm.

Thermal Switch . . .

. . . recommended by company for applications where "fast acting, sensitive, thermally responsive" regulation required for control of dangerously high, low temperatures—*Control Products, Inc., Dept. HPAC, 306 Sussex St., Harrison, N.J.*

Weighs less than 1 oz. Designed for operating differential of ± 1 deg with fast response. Has calibration temperature rating −20 to 1000 F. Will continue to operate accurately within rated capacity when subjected to momentary overshoots, undershoots, says manufacturer. Electrical rating is 1½ amperes at 28 volts, d-c.

30 Hp Blower. . .

. . .for deliveries to 2650 cfm—*General Blower Co., Dept. HPAC, Morton Grove, Ill.*

Designed for oil burner operation. Circular housing is said to provide

large diffusion area. Velocity pressure is converted to static pressure within housing itself. Recommended by company for multiple burner, multiple outlet applications. May be supplied with wheels made from aluminum, mild or stainless steel. Discharge is rotatable.

Support Bracket . . .

. . . standard equipment on company's "Slope Top Radiant Baseboard" covers for 1956—*Kritzer Radiant Coils, Inc., Dept. HPAC, 2901 Lawrence Ave., Chicago 25.*

Brackets extend full height of cover. Besides insuring proper registration of mounting holes, they add rigidity, durability to assembly, says company.

Electrode . . .

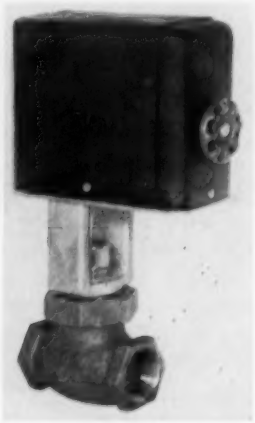
. . . for a-c or d-c current, designed for ease of operation—*Lincoln Electric Co., Dept. HPAC, 22801 St. Clair Ave., Cleveland 17.*

"Fleetweld 37" is said to have good arc stability, even when used with welding machines having low

EQUIPMENT DEVELOPMENTS

Continued

voltage. This permits using electrode with smaller transformer type welders, says company. Slag characteristics are said to make for quick removal, good bead appearance. Available in 1/8, 5/32, 3/16 in. sizes; packed in 50 lb packages.



2-Position Valve . . .

. . . for steam, water, oil, brine, gas, air service in office buildings, schools, hospitals, hotels, motels, industrial buildings, etc.—*National Controls, Inc., Dept. HPAC, 400 Homer St., Newton Centre, Mass.*

Motor operater unit has following cited features: heavy type unit bonnet globe pattern single seat with removable disc, industrial type operator with enclosed oil immersed gear train, "rugged" limit switches and provision for manual operation in event of power failure, universal mounting for accessibility.

Cold Water Insulation . . .

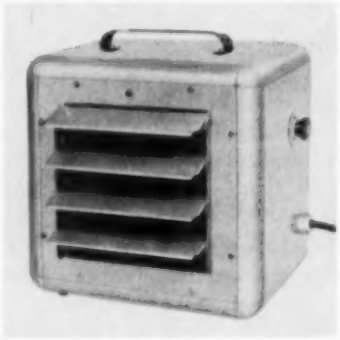
. . . in three types—*Philip Carey Mfg. Co., Dept. HPAC, Cincinnati* 15.

"Impervo" designed for use on ice water, cold water pipes to keep water cold, prevent sweating. "Perfecto" can be used for hot or cold water pipes. "Protecto" formulated to reduce danger of freezing of exposed water pipes. Cited features of products: control over thickness now available, less adhesive in combining insulating felts made possible.

Heat Flow Monitor. . .

. . .with compact, portable design—*National Instrument Laboratories, Inc., Dept. HPAC, 6108 Rhode Island Ave., Riverdale, Md.*

Designed to read directly, in Btu, heat flow through any surface in contact with disc. Core of instrument is "HF-2" disc, said to have output of 250 microvolts per Btu per sq ft per hr. Recommended by company for checking efficiency of structural, pipe and window insulation, and for checking heat flow loss of cooled or heated areas.



Electric Unit Heaters . . .

. . . with "Heat-Saver" feature—*Circle-Air Industries, Inc., Dept. HPAC, 244 Herkimer St., Brooklyn* 16.

Feature is designed to keep fan in operation after thermostat has been satisfied, and continue until fins cool to 210 F. Heat thus generated is delivered as useful warmed air, says manufacturer. In models 3000 to 10,000 watts. Recommended by company for use in factories, shops, garages, churches, lobbies, motels, etc.

Explosionproof Motors . . .

. . . in ratings 1 to 30 hp—*Electro Dynamic Div., General Dynamics Corp., Dept. HPAC, Bayonne, N.J.*

Designated type "H," motors made for class I, group D services for areas where inflammable gases, volatile liquids are present; for class II, groups F and G service for areas where combustible dusts are present. Rerated to NEMA frame sizes.

Spray Nozzle. . .

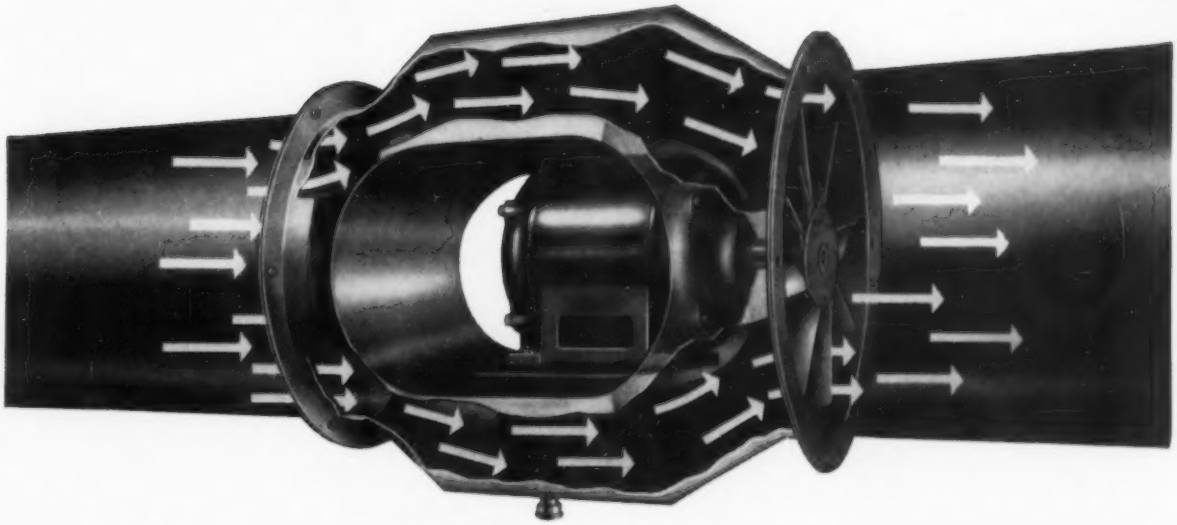
. . .for protection of transformers—*Bete Fog Nozzle, Inc., Dept. HPAC, 309 Wells St., Greenfield, Mass.*

With four nozzles, is now possible to isolate or extinguish transformer fire before it spreads to other equipment, says company. "T-1" designed to deliver 80 gpm at 25 psi with driving 80 deg full cone spray pattern. Has 2 in. female pipe thread.

Flexible Tubing . . .

. . . of seamless aluminum—*Seamlex Co., Inc., Dept. HPAC, 4123 24th St., Long Island City* 1, *N.Y.*

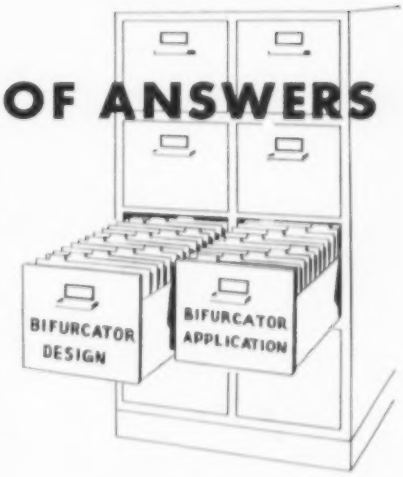
In new 2 in. ID size. Shown is unit with open pitch convolutions, integral cylindrical ends. Overall length is 9 in. Greater lengths available to 10 ft with open or close pitch helical convolutions, with or without metallic braid jacket. Line



The DeBothezat Bifurcator is a direct-driven fan in a divided housing. Fumes bypass the motor which always stays clean, cool and accessible. Installs like a section of duct-work . . . vertically, horizontally or at any angle.

Got a fume problem?

WE'VE A 30-YEAR FILE OF ANSWERS



When you specify a Bifurcator®, you get 30 years experience, from two sources. Not only the experience it takes to *design* top efficiency into a split housing fan . . . but the experience it takes to properly *apply* this fan to your specific fume problem. Production tooling assures accurate reproduction of wind-tunnel tested Bifurcator units. That's why DeBothezat Bifurcator Fan performance always proves your judgment was right — for insisting on a DeBothezat Bifurcator. Send for free Catalog DB-37-55.

De Bothezat FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION, DEPT. HP-456
American Machine and Metals, Inc.
East Moline, Illinois

☐ Send Bulletin DB-37-55 containing complete data on the Bifurcator for exhausting fumes.

☐ Have a DeBothezat representative call.

COMPANY

ADDRESS

CITY ZONE STATE

ATTENTION MR.

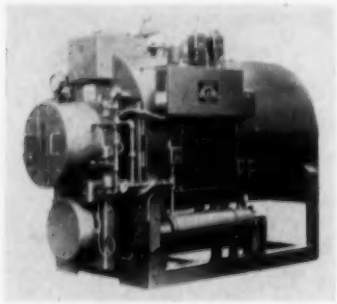
EQUIPMENT DEVELOPMENTS
Continued

now available in sizes ¼ to 2 in. ID. Smaller, larger sizes made to order, company says.

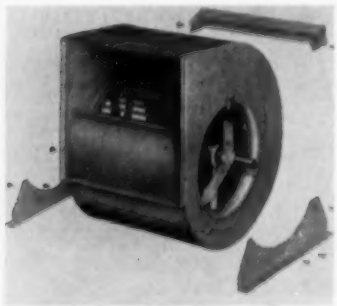
Boiler . . .

. . . designed for small size, high capacity—*Boiler Engineering & Supply Co., Inc., Dept. HPAC, Phoenixville, Pa.*

Handles to 50 hp requirements, yet meets conditions where space is limited, says company. Model "N50"



measures 7 ft 2 in. long, 3 ft 4 in. wide, 5 ft 2 in. high. Packaged unit equipped with burner, boiler trim, controls, glass fiber insulation, metal jacket. Can be furnished to burn light oil, No. 5 or gas. Also, combination units available, says company.



Blower . . .

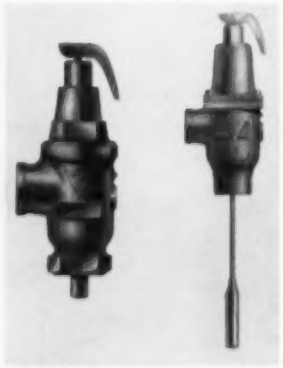
. . . with interchangeable mounting—*Utility Fan Corp., Dept. HPAC, 911 E. 59th St., Los Angeles* 1.

Mounting feature enables "IM-Pak" to be switched to any of four positions while in production, says company. Units in 9 to 16 in. size range. Two housing supports, motor mount brackets shipped unattached.

Well Type Manometers . . .

. . . designed for accurate measurements of pressure, vacuum, differential pressure in inches of water, inches of mercury—*Henry G. Dietz Co., Dept. HPAC, 12-16 Astoria Blvd., Long Island City 2, N. Y.*

May be wall mounted or used on table top. Designed with over pressure safety traps constructed of brass to prevent loss of fluid due to surge in line pressure. Units imprinted with special scales available, says company.



Relief Valves . . .

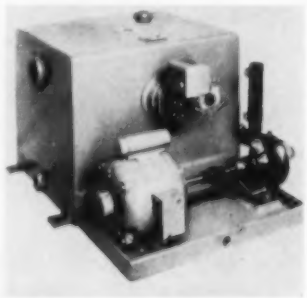
. . . for temperature, pressure service—*Watts Regulator Co., Dept. HPAC, Lawrence, Mass.*

Automatic self closing type. Series Nos. "140," "240" available in models with steam discharge capacities to 1,732,000 Btu per hr. Series "140," left, can also be furnished with extended thermostat where requirements do not allow valve to be placed close to vessel. Available with ¾ in. female inlet, ¾ in. female outlet or 1 in. male inlet, ¾ in. female outlet. Series "240," right, available with 1 in. female inlet, 1 in. female outlet or 1¼ in. male inlet with 1 in. female outlet.

1½ Hp Conditioner . . .

. . . added to company's line of built-in-wall units—*Amic Mfg. Corp., Dept. HPAC, 21-25 44th Ave., Long Island City, N.Y.*

Line previously available only in ½, ¾, 1 hp units. Company attributes need for increased rating to trend in apartment building design toward larger interior spaces.



Condensate Return . . .

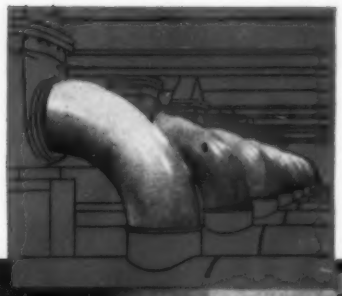
. . . pump designed for small size, large capacity—*Walter H. Eagan Co., Inc., Dept. HPAC, 2336 Fairmount Ave., Philadelphia* 30.

All bronze, centrifugal unit does not require pit, says company. Handles loads to 8000 sq ft at 20 psi. Cited features: nonclogging open impeller, stainless steel shaft, sealed ball bearing, flexible coupling and connections. Powered by ¼ hp capacitor type motor.

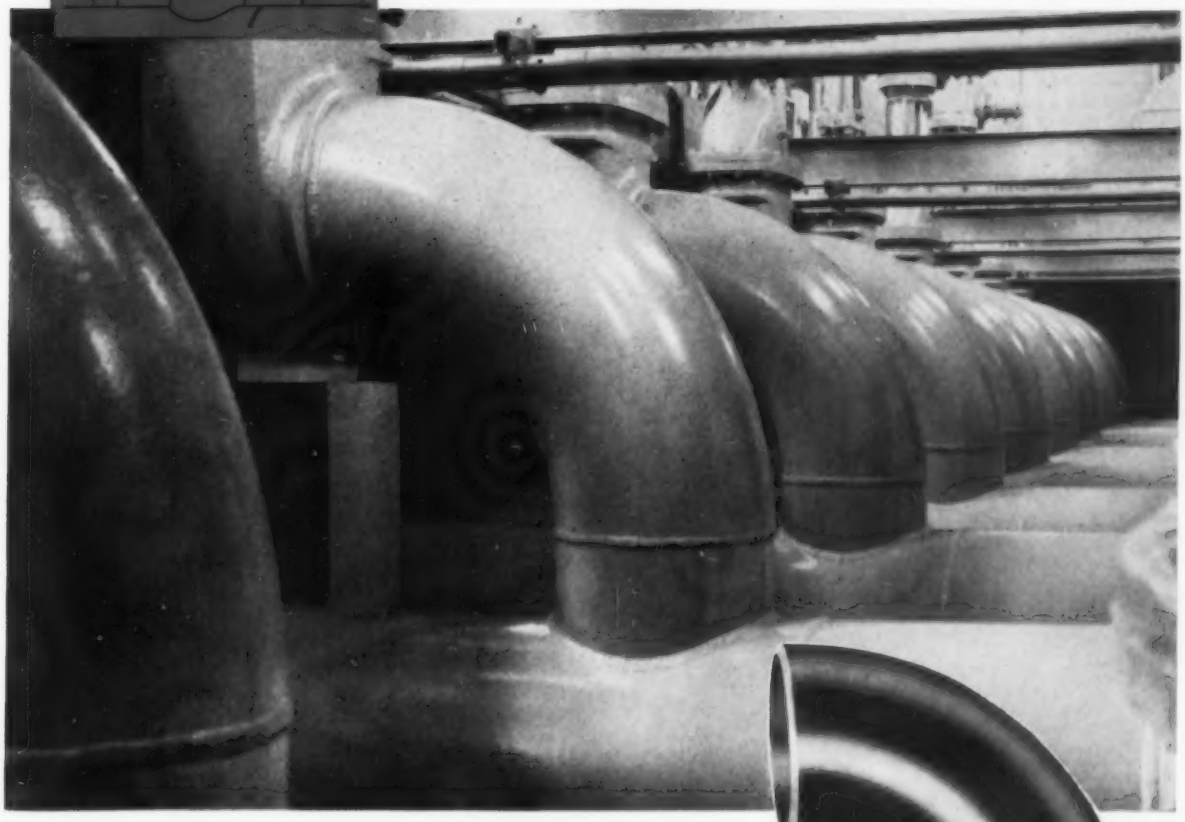
Two-Man Hoist . . .

. . . said to be capable of lifting 4000 lb as high as 18 ft—*Hastings Air Control, Inc., Dept. HPAC, 3215 Leavenworth St., Omaha* 5.

Designed for erecting suspended or platform mounted equipment, company recommends "Hoist-It" for use in installation of suspended air conditioners, elevated window conditioners, unit heaters, horizontal furnaces, etc. Consists of two sets of telescoping posts which fit from floor



These B&W Elbows Need Less ELBOW ROOM



ELBOW room was at a premium in this piping manifold. Fabricators chose B&W Fittings because they're easy to install, especially in a job like this which calls for "close-quarter" welding. Installation went ahead fast and without trouble, thanks to the accurate dimensions of the B&W Welding Ells used.

Maintenance, too, will be kept at a minimum because, with a sound weld, piping is permanent and leakproof. B&W Seamless Welding Fittings and Flanges are available in a complete range of grades, types, sizes and pipe schedules.

THE NATURAL SOURCE FOR ALLOY FITTINGS

B&W

TUBULAR PRODUCTS DIVISION

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION • FITTINGS DEPARTMENT
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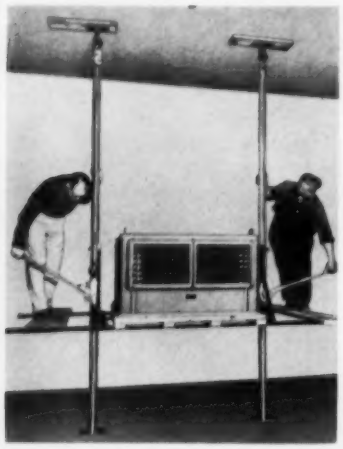
FA-6901

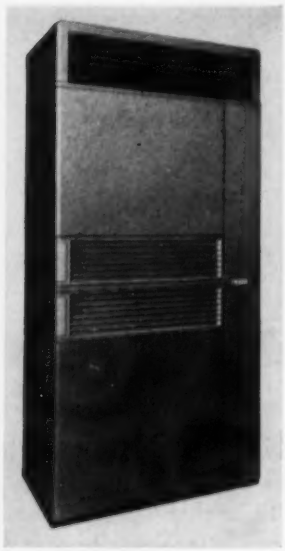
Seamless welding fittings and flanges, seamless and welded tubular products — in carbon, alloy and stainless steels.

EQUIPMENT DEVELOPMENTS

Continued



to ceiling. Hoisting brackets ride along posts, are lifted by pullers operating on airplane cable.



Air Conditioners . . .

. . . in commercial packaged line—*Trane Co., Dept. HPAC, La Crosse, Wis.*

Cited features: quiet operation, smart appearance, fresh air intake which bypasses compressor section, one-piece plenum chamber, fan motor mounted out of heated air stream, condenser arranged for single set of piping connections, field accessibility and serviceability. Basic components include hermetic compressor, "Delta-Flo" fin-coil. Line includes sizes ranging 3 to 20 tons.

LIMITORQUE

VALVE CONTROLS

push-button operation

Here's a completely automatic, dependable, low cost valve operator for small valves. Size-for-size, the types SMA-00 and SMA-000 Limitorque Valve Operators are designed for greater valve stem capacity; will produce more stem torque, and withstand greater thrust than any other operator on the market. They are readily adaptable to all types of valves—gate, plug, globe and butterfly; and they have many of the exclusive features which have made the larger Limitorque Operators the most widely used in the world.

Send for Catalog L-550 and see why this and other types of Limitorque Valve Operators are so widely used.

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INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA
BALTIMORE • CLEVELAND
LimiTorque Corporation Philadelphia
Industrial Gears & Speed Reducers • LimiTorque Valve Controls

The Stearns-Roger Building, home office of the firm at Denver, Colorado, designed, engineered, and constructed by Stearns-Roger with Mr. J. Roger Musick as consulting architect.

Air Conditioning in the mile high city . . .

and Ingersoll-Rand Centrifugal Pumps play their part . . .

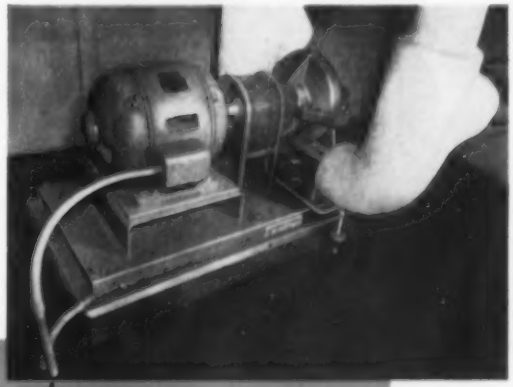
Installations such as this are becoming the rule rather than the exception these days. Even in the cooler areas of the country, office buildings, theatres, shopping centers, restaurants, hotels, hospitals, etc. are catering to the comfort of their employees and customers with central system air conditioning.

Ingersoll-Rand Centrifugal Pumps from ¼ horsepower up are ideal for cooling tower or chilled water service anywhere. These dependable pumps help give indoor comfort day in and day out with minimum maintenance and maximum efficiency.

When you are working on an air conditioning job check Ingersoll-Rand Circulating Pumps to do a bonus job for you. In the meantime, write for full information on I-R pumps for air conditioning service. Remember, the job is never too small nor too large for the Ingersoll-Rand Line.

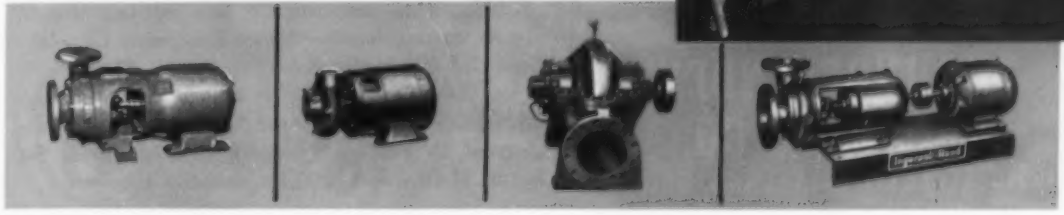
An Ingersoll-Rand Class 4CRVL 20 horsepower cradle-mounted pump on cold water circulation service. Delivery 860 gpm—head 55 feet.

An Ingersoll-Rand Class 4DMV 20 horsepower horizontally-split pump on cold water circulation service. Delivery 610 gpm—head 85 feet.



Ingersoll-Rand

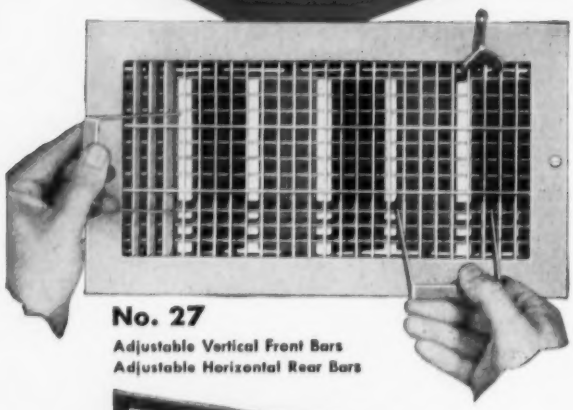
9-165 **11 Broadway, New York 4, N. Y.**



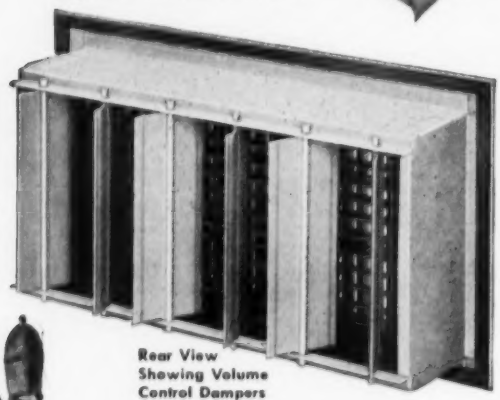
INDEPENDENT

"Fabrikated"

DOUBLE CORE REGISTERS
with opposed blade dampers
key control
For Commercial Installations



No. 27
Adjustable Vertical Front Bars
Adjustable Horizontal Rear Bars



Rear View
Showing Volume
Control Dampers

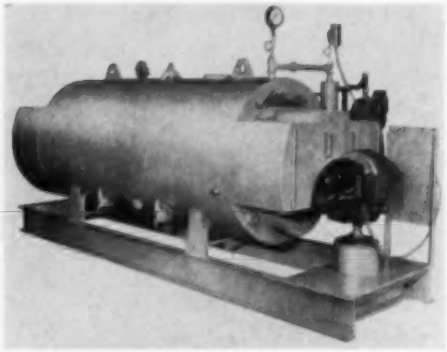
Write for Catalog
No. 56 which gives
complete details and sizes
up to 48" x "24

Always Leading—
Always Progressing

THE INDEPENDENT
REGISTER CO.
3747 E. 93rd STREET · CLEVELAND, OHIO

EQUIPMENT DEVELOPMENTS

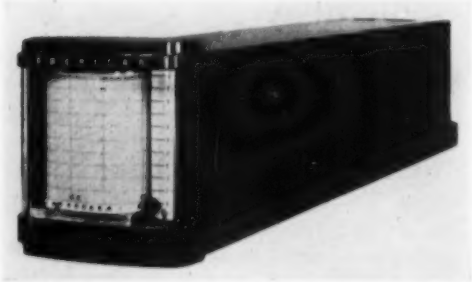
Continued



Steam Generator . . .

. . . for low pressure service—*Atlantic Steel Boiler Co., Dept. HPAC, Philadelphia 46.*

In six capacities 10 to 50 hp. Self contained unit is quick steaming, features low water line and high operating efficiency, says company. Designed to operate with natural draft. Where draft is deficient or where large stack is undesirable, can be supplied with induced draft fans.



Graphic Type Electronic Recorders . . .

. . . designed with measuring element "more than 50,000 times more powerful than conventional direct deflection movements"—*Industrial Controls Div., Manning, Maxwell & Moore, Inc., Dept. HPAC, Stratford, Conn.*

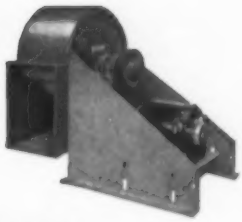
Pen drive mechanism is said to have ample power to operate alarm contacts with no loss of accuracy. Available as microammeter in ranges 0 to 200 microamperes to 0 to 100 milliamperes. As millivoltmeter, available in ranges 0 to 20 millivolts to 0 to 100 volts with input sensitivity to 6700 ohms per volt.

Motor Base. . .

. . . designed to automatically take up belt stretch, absorb starting loads—*Murray Equipment Co., Inc., Dept. HPAC, 11350 Schaefer, Detroit 27.*

No. 500 "Tens-A-Matic" is said to require no regular maintenance for proper belt drive tension. Engineered to cut belt changing time. Available for motors of all sizes to 200 hp, company announces.

nyb

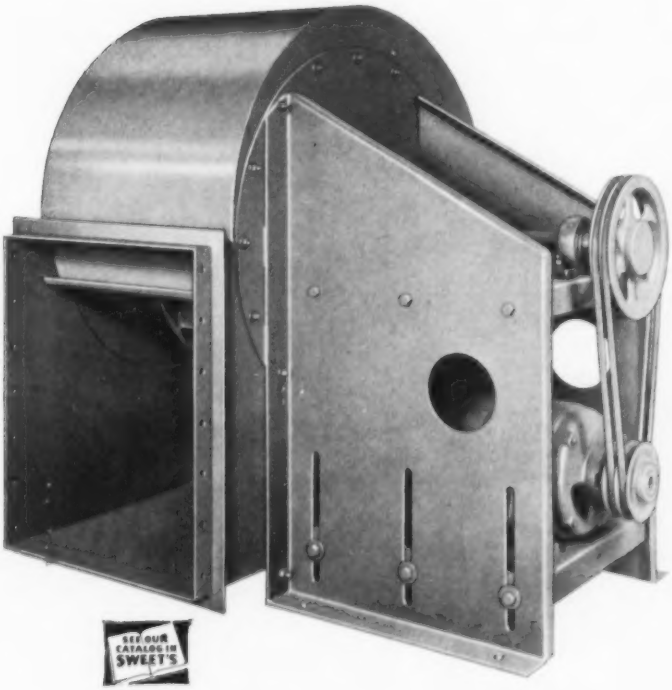


Nos. 76 and 91
Belted
Junior Fan

GENERAL PURPOSE FANS

Recommended for their ease of installation,

low maintenance cost and space saving features.



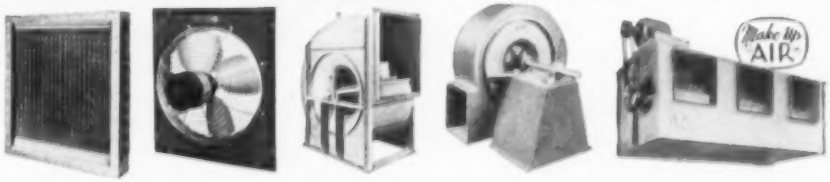
Portable, self-contained units of medium capacities for low pressure industrial and ventilating applications. Designed particularly for use with duct systems.

General Purpose Fans are made in three types and eight basic sizes with capacities from 1200 to 19,000 cfm. (Junior fans in five sizes from 160 to 4100 cfm). These include both direct connected and belt driven models.

No. 10 G. I.
Industrial Fan

with manganese bronze wheel, spark proof and acid resistant. For use in hazardous locations where explosive air mixtures are to be handled, and for handling hot gases and conveying materials in process. Two arrangements, two types of wheels. All fans reversible. Speeds up to 4500 rpm. For temperatures up to 350°.

nyb products have 65 years of manufacturing experience and engineering knowledge built into them. All ***nyb*** products are laboratory tested, accurately rated and fully guaranteed in strict accordance with standard test codes.



When working on your air handling problems, consult the *nyb* representative nearest you in our nationwide service or write for bulletins.

nyb **THE NEW YORK BLOWER COMPANY**

SALES OFFICES • 3159 SOUTH SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

• Soap solution • Calcium hypochlorite •

• Water containing abrasive particles • Carbon slurry • Ferric hydroxide •

Soap solution containing sand and ground glass • 25% grape juice concentrate •

• 50% caustic soda • Ferric sulphate • Ammonium sulphate • Demineralized water

Trisodium phosphate • Reactivated carbon • 1% chlorine solution • Sulphuric acid •

• 10% chromic acid • Humic acid • • Weak black liquor •

Waste sulphite liquor • Bleach liquor • • Slurries

Acid mine water • Liquid latex •

• Alkylaryl sulfonate •

• Sodium hydroxide •

• Calcium hydroxide •

• Calcium bisulphite •

Calcium hypochlorite •

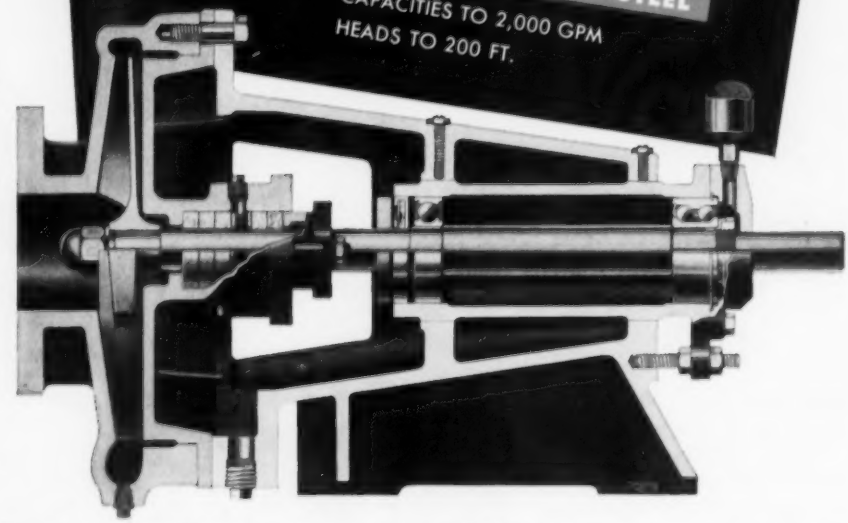
• Demineralized water

One pump handles all these problem liquids

DE LAVAL CPO PROCESS PUMP

WITH KK-20 STAINLESS STEEL

CAPACITIES TO 2,000 GPM
HEADS TO 200 FT.



The De Laval CPO Process Pump has stainless steel parts where it comes in contact with the liquid. The casing, end head, stuffing box, impeller, seal ring and gland are all of De Laval KK-20 (20-28 stainless with molybdenum and copper). The shaft and lock nut are made of other suitable stainless steels. • Three bearing pedestals accommodate nine wet end sizes. Off-the-shelf parts in ferrous and nonferrous combinations permit changing size or metallurgy after installation. CPO pumps are available with both conventional packing and mechanical seals.

WRITE FOR BULLETIN 1125-B

DE LAVAL *Centrifugal Pumps*

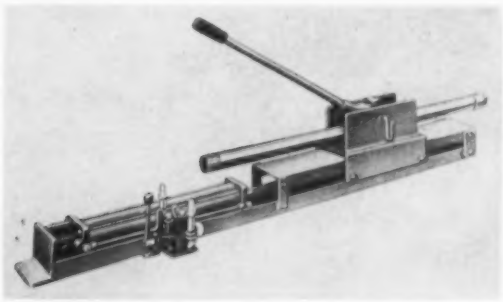
DE LAVAL STEAM TURBINE COMPANY

871 Nottingham Way, Trenton 2, New Jersey

DL-831

EQUIPMENT DEVELOPMENTS

Continued



Pipe Pusher. . .

. . . designed to eliminate trenching, damage to streets and landscaping in underground pipe installation—*Mercury Hydraulics, Inc., Dept. HPAC, 2440 Blake St., Denver 5.*

Pipe gripped in powered carriage penetrates earth with continuous 21 in. thrust without alteration of power, change of speed, says company. Also pulls pipe by reversing principle of operation. "Speed-Thru" is said to average 4 fpm, pushing or pulling.

Heating, Air Conditioning Unit. . .

. . . designed to speed hotel, apartment modernization projects—*Amic Mfg. Corp., Dept. HPAC, Long Island City, N. Y.*

Can be installed in one or two days while room is normally vacant, says company. Engineered to fit underneath window sill height, connect to existing heating system. Each unit provides individual temperature control.

Return Air Grilles. . .

. . . styled to blend with modern room interiors—*Air Control Products, Inc., Dept. HPAC, Coopersville, Mich.*

Models available for either sidewall or baseboard grille installations. Both series available in sizes 8 × 6 to 30 × 6.

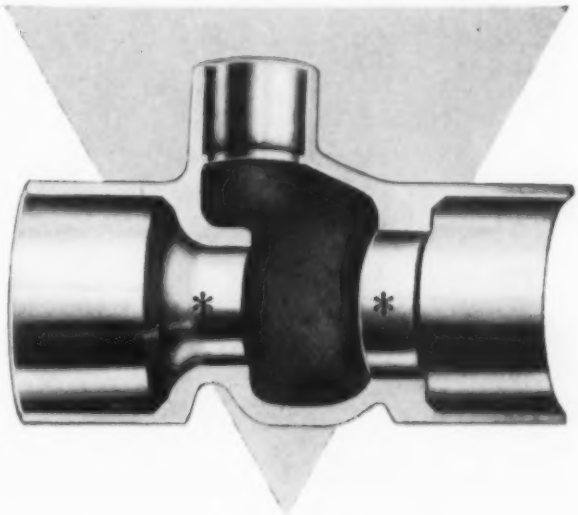
Purifier. . .

. . . for exhaust steam so it can be re-used for heat exchangers, unit heaters, or for heating or condensate—*V. D. Anderson Co., Dept. HPAC, 1935 W. 96th St., Cleveland 2.*

Designed for installation in exhaust steam lines from steam hammer, reciprocating engines, other steam equipment. Condensate, oil droplets, other mist

TACO

Engineered Venturi Fittings



based on

"Bernoulli's Theorem"

the design results in:

1. A constant percentage of hot water diversion to the radiator at any rate of water flow thru the fitting and main.
2. A jet action with its highest efficiency (maximum diversion with minimum pressure drop) within the flow rates recommended in Taco Design Tables.
3. Increased capacities.
4. A more compact fitting for faster and easier installation.

* 5. A precision-machined fitting for perfect performance *all* the time.

Taco *Engineered* Venturi Fittings are manufactured under rigid Quality Control.

For Further Information See Your Wholesaler or Write

Patent Pending

BETTER HEATING — TACO — BETTER WITH TACO

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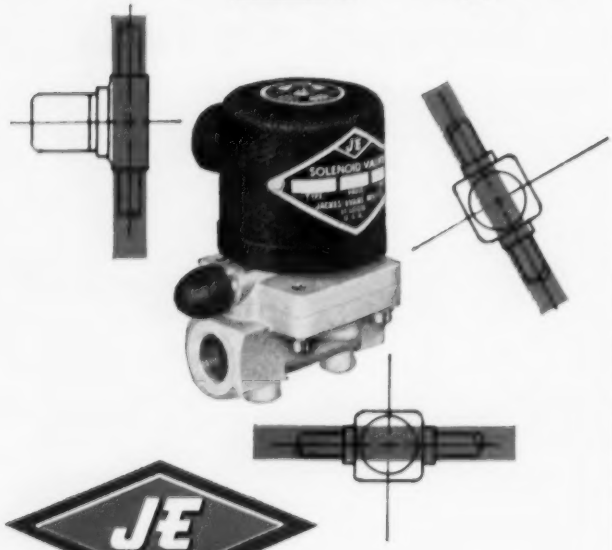
What's Your Angle?



JE

SOLENOID VALVES

Work perfectly in any position*

You never have to worry about keeping lines horizontal when you install J-E solenoid valves. J-E's advanced design permits the valve to operate perfectly . . . even on a slant of up to 90°. The only requirement is that the coil is not below the valve body.*

- **SIMPLE INSTALLATION** . . . is one reason why more and more installation men are asking their wholesalers for J-E . . . the only solenoid valve that also gives you:
- **QUIET OPERATION** . . . no mechanical linkage or impact action
- **DEPENDABILITY** . . . tight seating, yet no chance for jamming or clogging
- **EASY MAINTENANCE** . . . only two moving parts . . . cool-operating coils . . . one size coil and one plunger to fit all valves

CALL YOUR WHOLESALER . . . or write us today!

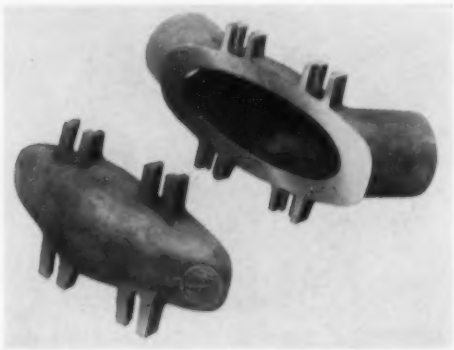
JACKES-EVANS MANUFACTURING CO.

Controls Division -43

4427 Geraldine Avenue • St. Louis 15, Mo.

EQUIPMENT DEVELOPMENTS *Continued*

entrainment intercepted from exhaust steam by two-stage principle of separation incorporated into receiver. Engineered to handle to 70,000 lb per hr of steam and minimum load of 3000 lb per hr at 8 psig operating pressure.



Impact Fittings . . .

. . . with reversible wear back designed to provide long life, low friction loss in materials handling piping—*Allen-Sherman-Hoff Co., Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

Wear back bolted to body through slotted lugs for replacement, reversing. Thin coating of sealing compound to contact surfaces facilitates airtight joint, says company. Line includes 45, 90 deg elbows, 45 deg lateral fitting in sizes 4, 5, 6, in. Wear backs interchangeable for all types in same size.

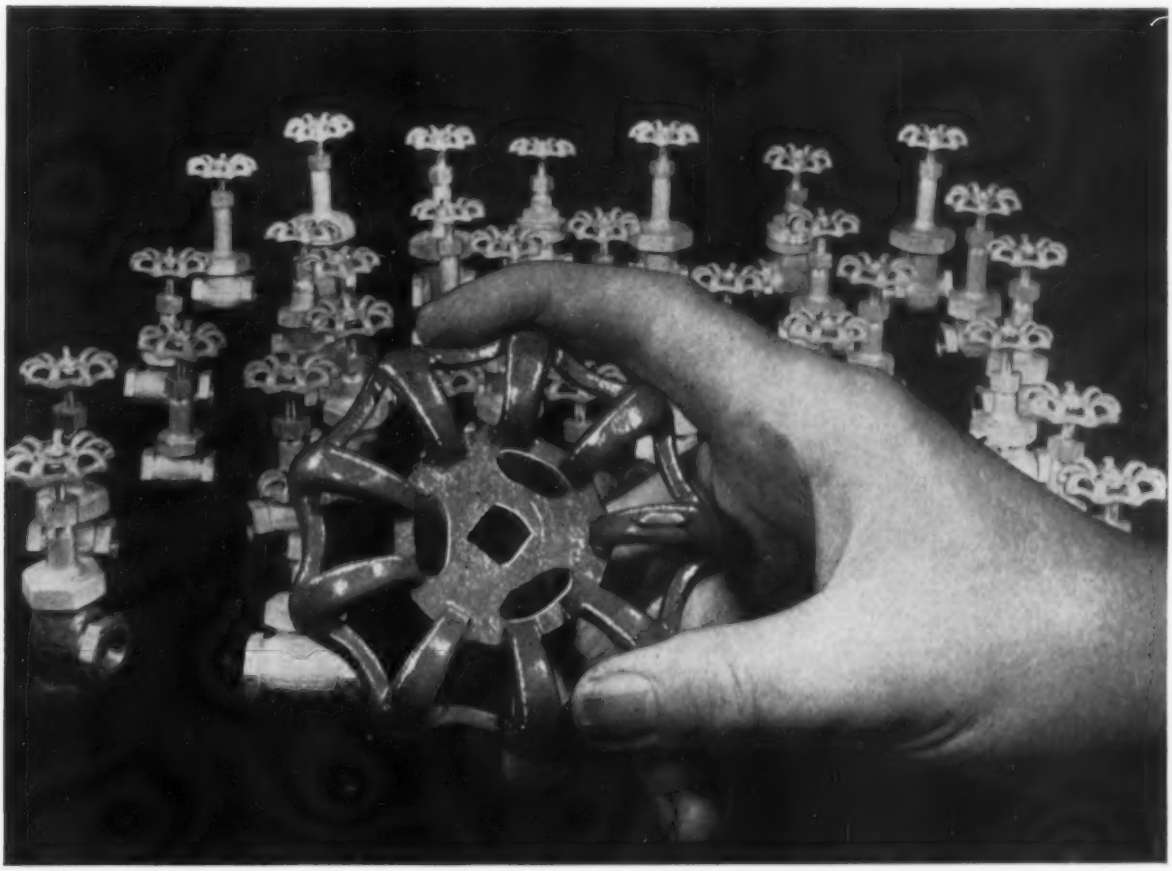
5 Ton Summer Conditioners. . .

. . . for commercial, large residential applications—*Armstrong Furnace Co., Dept. HPAC, 851 W. Third Ave., Columbus, O.*

Air cooled units engineered for easy installation—outside building. Evaporators, condensing units shipped assembled. Two 13 in. wide blowers, powered with 1/3 hp motors, deliver to 5000 cfm across condenser coil. Unit available in 230 volt single phase, 208-220 volt three phase models.

Shell and Tube Condensers . . .

. . . designed for high capacities, low water pressure drops, simple cleanability—*Standard Refrigeration*



One handwheel fits 39* different valves

*Walworth Handwheel No. 16 fits these Walworth Bronze Valves:	
¾"	No. 32, 40, 47, 48, 205, 206, 225P, 227P, 260, 261, 260P, 261P
1"	No. 29, 30, 36, 37, 91, OX91, 92, 95, 96, 160, 161, 235, 236, 245, 246, 245P, 246P, 237P, 238P
1¼"	No. 58, 59
1½"	No. 2, 3, 4, 11, 12, 14

Only Walworth Bronze Valves give you this degree of interchangeability

With standardized Walworth Bronze Valve parts you maintain the greatest number of valves with the smallest inventory of basic parts. Handwheels are just one example. Fourteen different sizes of handwheels are all you need for fifty lines of gate, globe, and angle valves, involving 420 individual valves.

The Walworth system of interchangeability of parts for Bronze Valves is unsurpassed by any manufacturer in the field. In addition to Bronze Valves, Walworth produces valves and pipe fittings of iron, steel, special alloys, and rigid polyvinyl chloride (PVC).

Learn more about Walworth interchangeability. Contact your local Walworth Distributor or nearby Walworth Sales Office. Ask for literature.

WALWORTH

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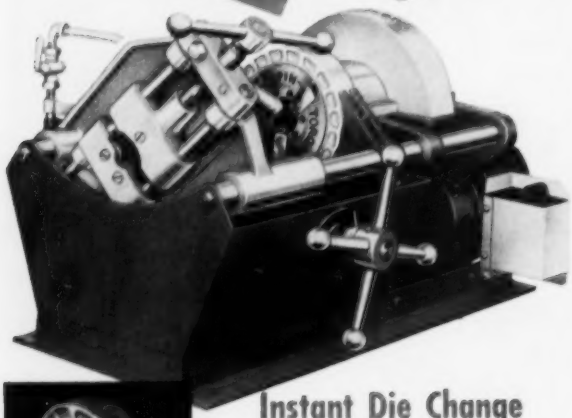
SUBSIDIARIES: ALOYCO ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION M&H M & H VALVE & FITTINGS CO. SW SOUTHWEST FABRICATING & WELDING CO., INC. WALWORTH COMPANY OF CANADA, LTD.

TOLEDO

No. 999 Faster Than Ever!



Instant Die Change
Spin Torque Chucking
High Speed Threading

Toledo Spin Torque Chuck For Faster Production

Quick change features of the TOLEDO No. 999 Pipe Threading Machine have proved real time and money savers on hundreds of jobs. Now . . . with the addition of the Toledo Spin Torque Chuck even faster production is provided. Instant changeover from cutting to threading . . . Spin Torque Chucking—a quick spin and pipe up to 2" is locked in the chuck—no wrenches, no rocking, socking or hammering. Bench type or portable floor models, full ½ H.P. motor powers heavy gear train drive, finger tip controls. Remember—if it bears the TOLEDO label you know it's a dependable product. See it at your suppliers or write for complete information. The Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo 4, Ohio.

THE TOLEDO PIPE THREADING MACHINE CO.
1445 Summit St. TOLEDO 4, OHIO

BUILDERS OF THE WORLD'S FINEST PIPE TOOLS

TOLEDO

PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

EQUIPMENT DEVELOPMENTS

Continued

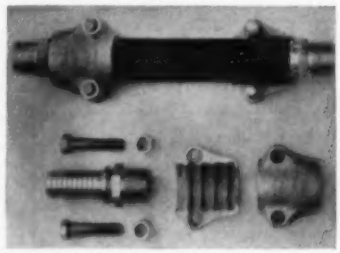
Co., Dept. HPAC, 332 S. Hoyne Ave., Chicago 12.

Recommended by company where space limitations require smaller units. Condensing capacity of "KY" series is 15,000 Btu per hr per hp at 105 F, with either 1½ gpm per hp at 75 F or 3 gpm per hp at 85 F. Cited feature is that low water pressure drops make cross connections for tower service unnecessary.

Insulation . . .

. . . designed for installation in wide spaces between steel studs, beams—*Infra Insulation, Inc., Dept. HPAC, 525 Broadway, New York 12.*

Extra wide web-to-web insulation is said to provide complete coverage for 24, 30, 48, 60 in. and wider centers. In continuous lengths to 750 ft. In installation, flanges attached to framing with special clips, made expressly for this purpose, says company.



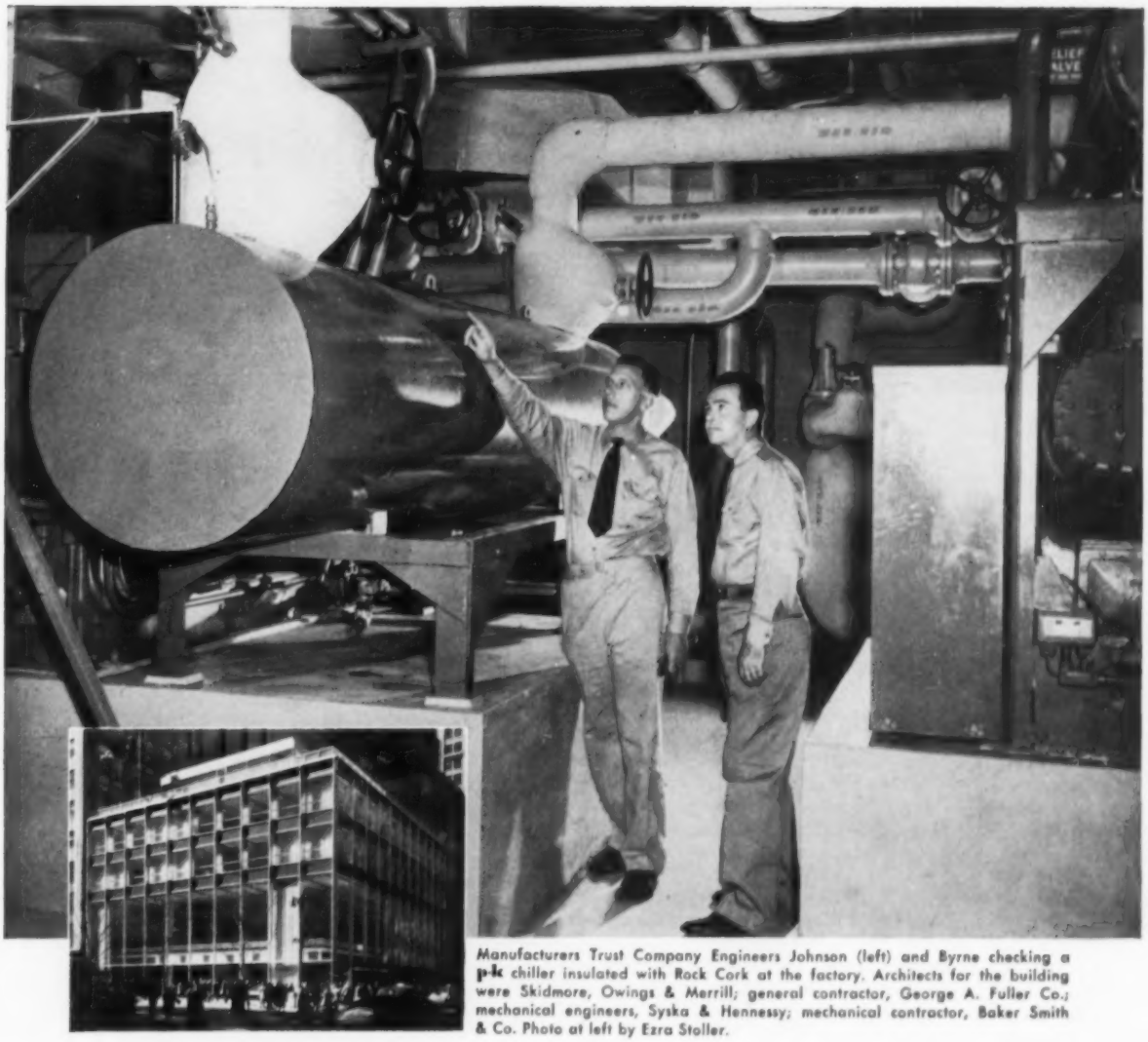
Fittings . . .

. . . in two types for industrial usage—*Flex-O-Tube Div. of Meridan Corp., Dept. HPAC, 2525 Jim Daly Rd., Inkster, Mich.*

One type, shown, is two-bolt clamp fitting for high pressure applications for hydraulic lines, steam hoses, liquid petroleum gas transmission. Other is push-on type for low pressure use on machine tools or for shop air, water, fuel, lubrication lines.

Hose Coupling. . .

. . . for high, medium, low, suction return applications —*Anchor Coupling Co., Inc., Dept. HPAC, 342 N.*



Manufacturers Trust Company Engineers Johnson (left) and Byrne checking a p-k chiller insulated with Rock Cork at the factory. Architects for the building were Skidmore, Owings & Merrill; general contractor, George A. Fuller Co.; mechanical engineers, Syska & Hennessy; mechanical contractor, Baker Smith & Co. Photo at left by Ezra Stoller.

Worthington relies on p-k chillers in the world's most distinctive bank building

When this "house of glass" opened at the corner of Fifth Ave. and 43rd Street in New York last year, 40,000 visitors came to take a look. Small wonder! For in this newest and largest branch of Manufacturers Trust Company, they saw architectural history being made.

No longer are bank tellers "caged." Customers transact their business in a new atmosphere of space, light and friendliness.

Contributing to this feeling of unhurried friendliness are two 150-ton Worthington air conditioning units, each equipped with a p-k dry expansion Freon chiller. This super-efficient system "reconditions" all five stories of the building every three to five minutes with 97,000 cu. ft. of fresh, low-humidity, 74 F air. It's automatic, too, shutting down by itself at 11 P.M. and starting again at 6 A.M., to assure a comfortable working climate for the bank's 280 employees – and their customers – at the start of each day.

Teamed up with Worthington's famous "million dollar" compressors, p-k chillers each supply blowers with 331 gallons of water per minute, chilled from 50 F to 40 F.

For full information on these complete units write Worthington Corp., Dept. PK, Harrison, N. J. today. Or write for Catalog 101 on p-k chillers to The Patterson-Kelley Co., Inc., 740 Burson Street, East Stroudsburg, Pa., and principal cities.

PATTERSON-KELLEY

Flooded and Dry Expansion Type Freon Coolers and Storage Water Coolers • Freon Condensers • Allied Refrigeration and Air Conditioning Equipment

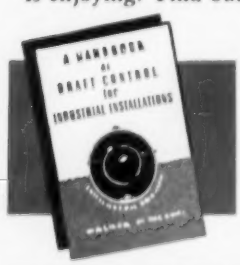
Read the facts on

Walker

"BB" Industrial Draft Controls

In the Fairmac Corporation Housing Development near Washington, D.C., replacement of existing "controls" with Walker "BB" Draft Regulators reduced fuel consumption in two boiler houses to such an extent that the cash savings actually paid for complete installation of all 85 Walker draft units! These fuel savings were accomplished in only *three months time*—and they were so spectacular that the April, 1953 issue of *Fueloil & Oilheat* devoted its lead article to a report of the complete details of the story! Reprints of this article are available upon request.

Walker "BB" Industrial Draft Controls can bring you the same kind of savings that the Fairmac Corporation is enjoying. Find out how by reading Walker's "Handbook of Draft Control for Industrial Installations." It gives the most complete facts ever assembled on control selection, proper location, capacities, installation and adjustment. This valuable handbook is absolutely free — and your request for a copy puts you under no obligation. Reserve your copy now—just send coupon below to:



Walker
MANUFACTURING & SALES CO.
1720 Penn St., St. Joseph, Mo.

Gentlemen: I want the complete story on how Walker "BB" Industrial Draft Controls can cut my fuel costs. Please send me your free handbook on "Draft Control for Industrial Installations." I'm considering draft control installations on:

Name.....

Company.....

Address.....

State.....

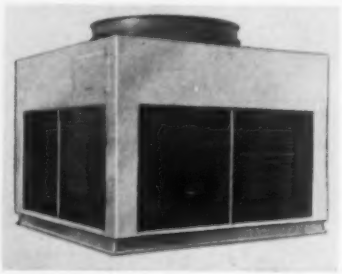
Office Building ☐
School ☐
Apartment ☐
Theater ☐
Store ☐
Factory ☐
Laundry ☐
Garage ☐
Other _____

EQUIPMENT DEVELOPMENTS

Continued

Fourth St., Libertyville, Ill.

"Flanco" four-bolt, split-flange unit employs O-ring seal. Requires no thread compounds, says company, and only automotive type wrench needed for installing.



Air Cooled Condensers . . .

. . . for fluorinated hydrocarbon refrigerants (Nos. 12 and 22)—Manufactured by *Tru-Air Corp.*, units distributed by *M. Blazer & Son., Dept. HPAC, 173 Market St., Passaic, N. J.*

With capacities to 200 tons. Designed to permit large tonnage jobs to be operated without water for condensing purposes. Only service required is annual fan motor lubrication, say company.

Lightweight Motor . . .

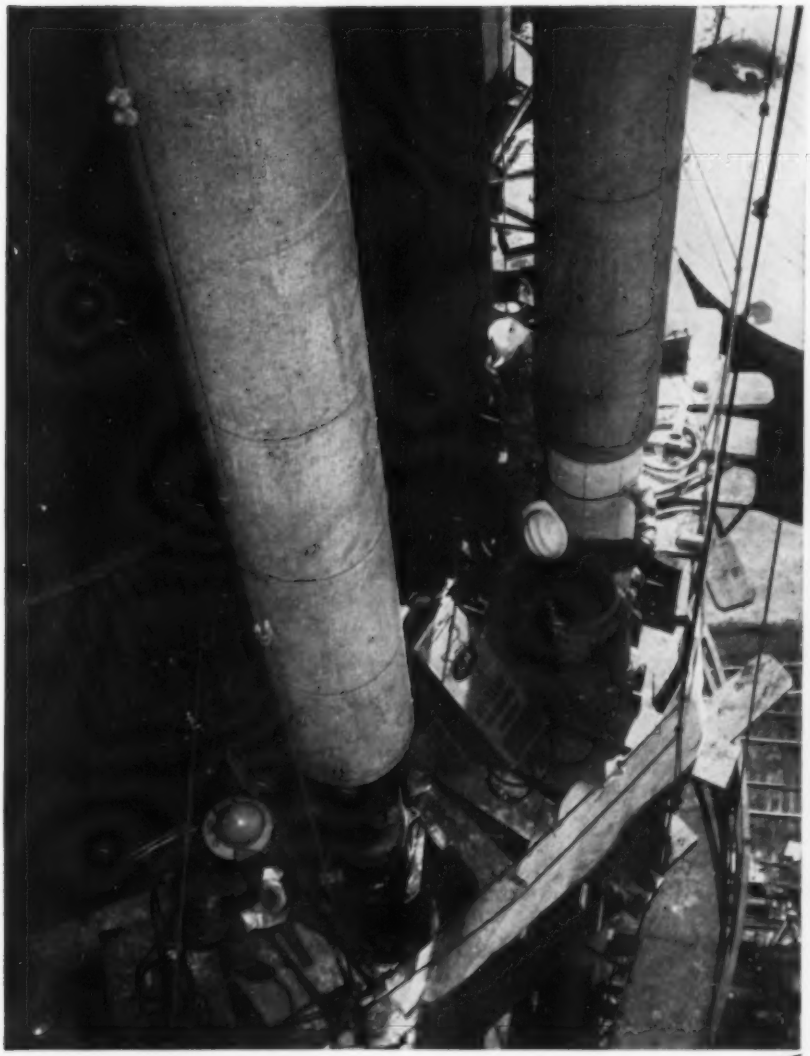
. . . for oil burners—*Ohio Electric Mfg. Co., Dept. HPAC, 5400 Dunham Rd., Maple Heights, Cleveland.*

Recommended by company for heavy duty service in burners used in industrial plants, institutions, apartment houses, etc. Built to NEMA No. 56 frame, units designated as 14 hp series "991." Available for 115 or 230 volts 50 cycle (1450 rpm) or 60 cycle (1725 rpm) operation.

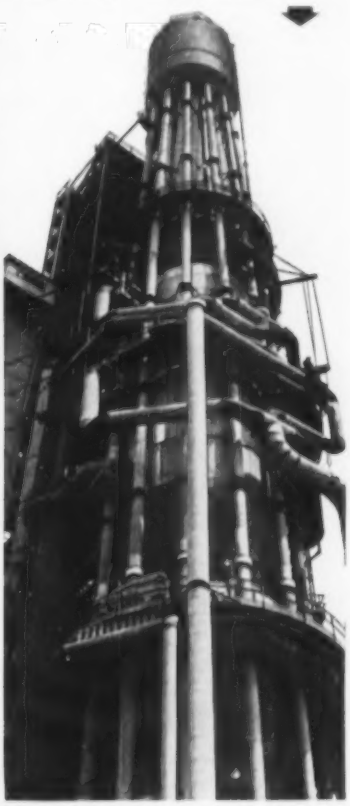
Air Conditioner . . .

. . . for built-in-wall installation—*Lewyt Air Conditioner Corp., Dept. HPAC, 5702 First Ave., Brooklyn.*

"Deluxe" model has 1 ton capacity. Measures 20 in. high, 17 in. deep, 32 7/16 in. wide.



The World's Largest Houdriflow, at the Sun Oil Company refinery, Marcus Hook, Pa., is 350 feet high. Lift piping to its reactor tank is insulated with a combination of K&M Hy-Temp and K&M "Featherweight" 85% Magnesia.



Easily Applied, Hy-Temp and "Featherweight" insulations quickly go on 14" lift pipes high above ground. This huge catalytic petroleum cracking unit embodies some 2½ miles of insulated piping. Insulation contractor: Armstrong Cork Company.

K&M Thermal Insulations help keep the world's biggest "cat" purring

It takes plenty of heat to crack petroleum. This king-size catalytic cracking plant ("cat") works 24 hours a day, seven days a week—with operating temperatures as high as 1500°F. K&M Thermal Insulations minimize heat loss and keep heat on the job here, just as they do in power plants, factories, and institutions the country over.

K&M "Featherweight" 85% Magnesia and Hy-Temp Insulations withstand moisture, vibration, frequent temperature changes. For efficiency to 1900°F., these insulations are applied in combination, with staggered joints. This eliminates heat loss that normally occurs in single-layer installations when expansion causes joints to open. "Featherweight" is efficient to 600°F. when used solely.

Plan your new plant with these heat-saving, cost-saving insulations in mind. Bring your present plant up to date with K&M Thermal Insulations. Contact your K&M distributor, an experienced applicator, for full details. Or write directly to us.

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos

THREE THINGS TO CONSIDER
in Selecting STEAM TRAPS

1. HOW MUCH CONDENSATE AT PEAK LOAD?

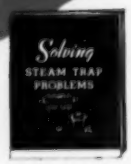
First determine how much condensate you'll have in the system at the peak load. When this is not known it can be easily figured by referring to the Anderson book "Solving Steam Trap Problems." However, to provide for a margin of safety the rating of the trap should be more than the condensate to be handled. The capacity rating factor should be at least two and sometimes as high as six, depending upon the steam condensing surface, the air to be vented as well as the type of trap used. By using Heat-Kwiks you never need a factor of more than 2 to 1. Therefore you get by with a smaller, less expensive unit.

2. HOW FAST MUST THE AIR BE VENTED?

It is desirable to heat up cookers, kettles, dryers, laundry and dry cleaning equipment, etc., quickly in order to increase production. Whenever this condition exists select Heat-Kwik Steam Trap. This trap vents air 8 times faster. The added production soon pays for the cost of the trap.

3. WHAT IS THE STEAM PRESSURE VARIATION?

When the pressure of a steam line drops off, the condensate-venting capacity of the conventional inverted bucket steam trap also falls off. Therefore if the pressure varies, choose a steam trap with a combination open float and bellows orifice . . . Heat-Kwik Steam Trap. The auxiliary bellows actuated orifice is unaffected by pressure.

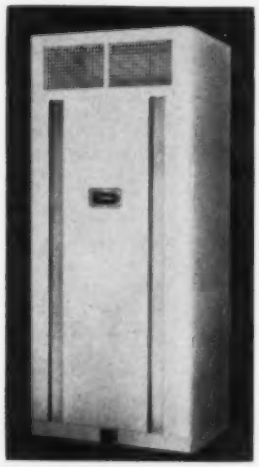


Free!
96-page book "Solving Steam Trap Problems" shows how to select the right steam trap for any equipment. Write for your copy today.

The V. D. ANDERSON Company
Division of International Basic Economy Corp.
1949 West 96th Street, Cleveland 2, Ohio

SUPER-SILVERTOP
HEAT-KWIKS
the Engineered Steam Trap by
ANDERSON

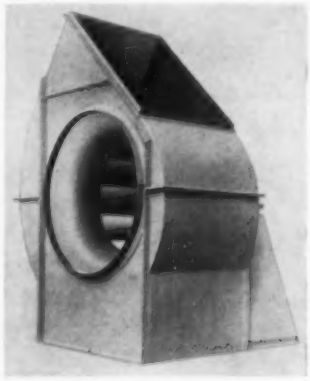
EQUIPMENT DEVELOPMENTS
Continued



Air Conditioner . . .

. . .designed for super market meat cutting rooms—*Typhoon Air Conditioning Co., Inc., Dept. HPAC,* 505 *Carroll St., Brooklyn* 15.

In 3, 5, 8 ton capacities. Baked white enamel finish easy to keep clean, says company. Engineered for lower than normal temperatures by means of additional low temperature limit cutoff said to prevent cooling coil's freezing.



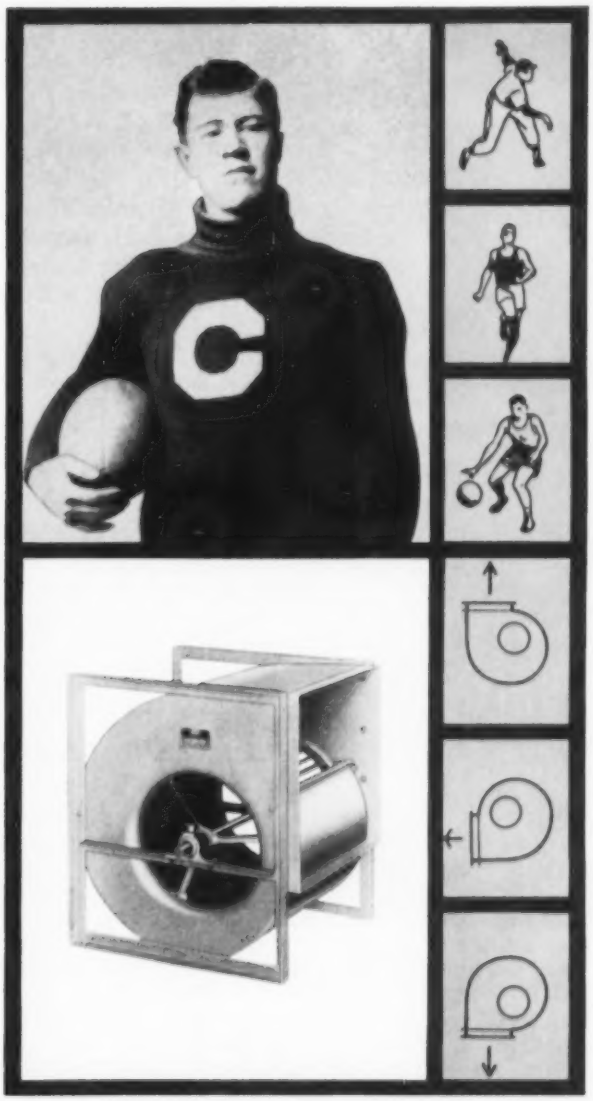
Centrifugal Fans . . .

. . . designed for range of commercial and industrial ventilating, air conditioning, heating applications—*Chicago Blower Corp., Dept. HPAC,* 9869 *Pacific Ave., Franklin Park, Ill.*

Engineered for high efficiency, low noise levels. Range of wheel diameters available in backward curved, forward curved fans. Both types for direct or V-belt drive. Recommended

all-around MAN

all-around FAN



Remember the great Jim Thorpe? He could move from sport to sport . . . be a champion in all sports. Baseball, football, track, field—you name it—Jim could play it like the hero he was. Truly, he deserved the accolade "all-around man" of the sports world.

At Utility, we have an all-around blower as versatile as Mr. Thorpe in performing well at a number of jobs. A 4-Way Discharge Blower, it adjusts quickly to any of four positions—top horizontal, top vertical, bottom horizontal or bottom vertical. Actually, it's an **eight**-position fan, since it faces left or right at any of the above angles.

The rigid frame is the key to this blower's complete convertibility. You simply place the fan in the desired discharge position, and the job is done—without bolts or screws or costly sheet metal work. The rigid frame also adds a bonus of strength and stability to the installation. It's a boon from an inventory standpoint. Available in single and double widths, this blower takes care of many jobs without emergency re-ordering or cutting-to-fit on the job.

Of course, world-renowned Utility quality is built right in, with one-piece wheel for rigidity, long life and whisper-quiet operation. And because of Utility's years-ahead production techniques, this "all-around fan" is priced right down with the lowest. Proving again that when quality and price must get together, it makes sense to "get together" with Utility!

A Division of Utility Appliance Corp.

UTILITY FAN CORP.

911 East 59th Street, Los Angeles 1, California

UTILITY

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

why accept this result?

Air near the steam supply header is heated while air near the return end is unheated
Temperature stratification mars system results
Condensate may be exposed to freezing

In conventional steam distributing tube surface the steam is apportioned equally among all the tubes and, under low modulation, the steam travels only partially across the surface . . . but in

Nesbitt **HEATING SURFACE**
WITH THE NEW TROMBONE DISTRIBUTING TUBES

The steam is apportioned to alternate tubes — a given quantity of steam travels twice as far in "trombone" tubes. Even the smallest quantities are distributed over the entire surface area.

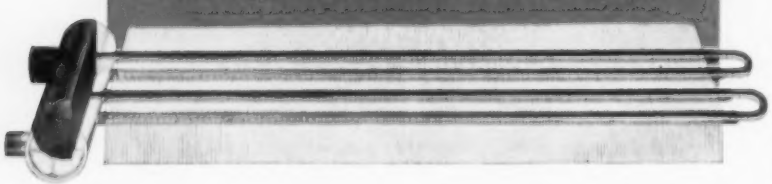
Each trombone steam-distributing tube serves two adjacent condensing tubes from a single supply-header connection. Steam must travel across the first leg of the trombone tube (the full length of the surface) before reversing, under increased demand, to serve the second leg.

This entirely new principle of steam distribution eliminates stratification and the danger of freezing over virtually the entire capacity range. Therefore, Nesbitt Series T Surface is unmatched for heating and ventilating applications with modulating valve control and for preheating outdoor air.

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. — Send for Publication 305.

when you can have this!

Uniform final air-discharge temperatures over the full length of the surface
Ideal system results under modulated control
Positive inherent protection against freezing



EQUIPMENT DEVELOPMENTS

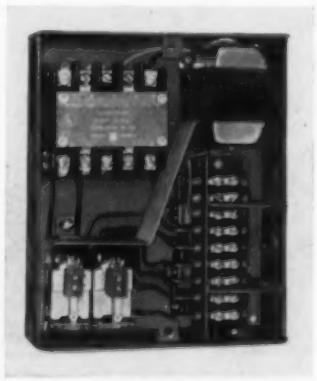
Continued

by company for handling air, gases to 600 F. Wheel diameters range 12¼ to 143 in.

Centrifugal Pump . . .

. . . designed to "never lose its prime" —*Lancaster Pump and Mfg. Co., Inc., Dept. HPAC, Manheim Rd., Lancaster, Pa.*

Equipped with capacitor motor, bronze stub shaft, balanced bronze impeller. Available in ¾, 1, 1½ hp models. With ceramic seat mechanical seals, "hydro-lock" feature, said to assure pump efficiency.



Master Control Panel . . .

. . . for air conditioning systems— *General Controls Co., Dept. HPAC, Skokie, Ill.*

Transformer, relays, pressure switches, motor contactors, other electrical controls located in unit. Low voltage terminals isolated from high voltage terminals. Components prewired. Designed for time, labor savings.

INSULATION news from L·O·F GLASS FIBERS COMPANY

In the new-model **YORKAIRE** Conditioners,

Microlite controls noise and heat . . . is easy to install!

Here's what they say at York Corporation: "We use L·O·F Glass Fibers' Microlite because of its high thermal and acoustical efficiency . . . and because it is easy to fabricate."

The inorganic glass fibers in Microlite form countless dead air cells . . . enabling Microlite to absorb sound, and insulate against heat very effectively!

What's more, Microlite is economical to fabricate. Its long, fine glass fibers give it high tensile strength and resiliency. Thus it cuts cleanly and accurately to fit even the most irregular spaces . . . handles without danger of tearing!

Look at all of these other Microlite advantages . . .

- Lightweight!
- Resists settling!
- Pleasant to handle!
- Does not burn!
- Needs less space!
- Resists rot and mildew!

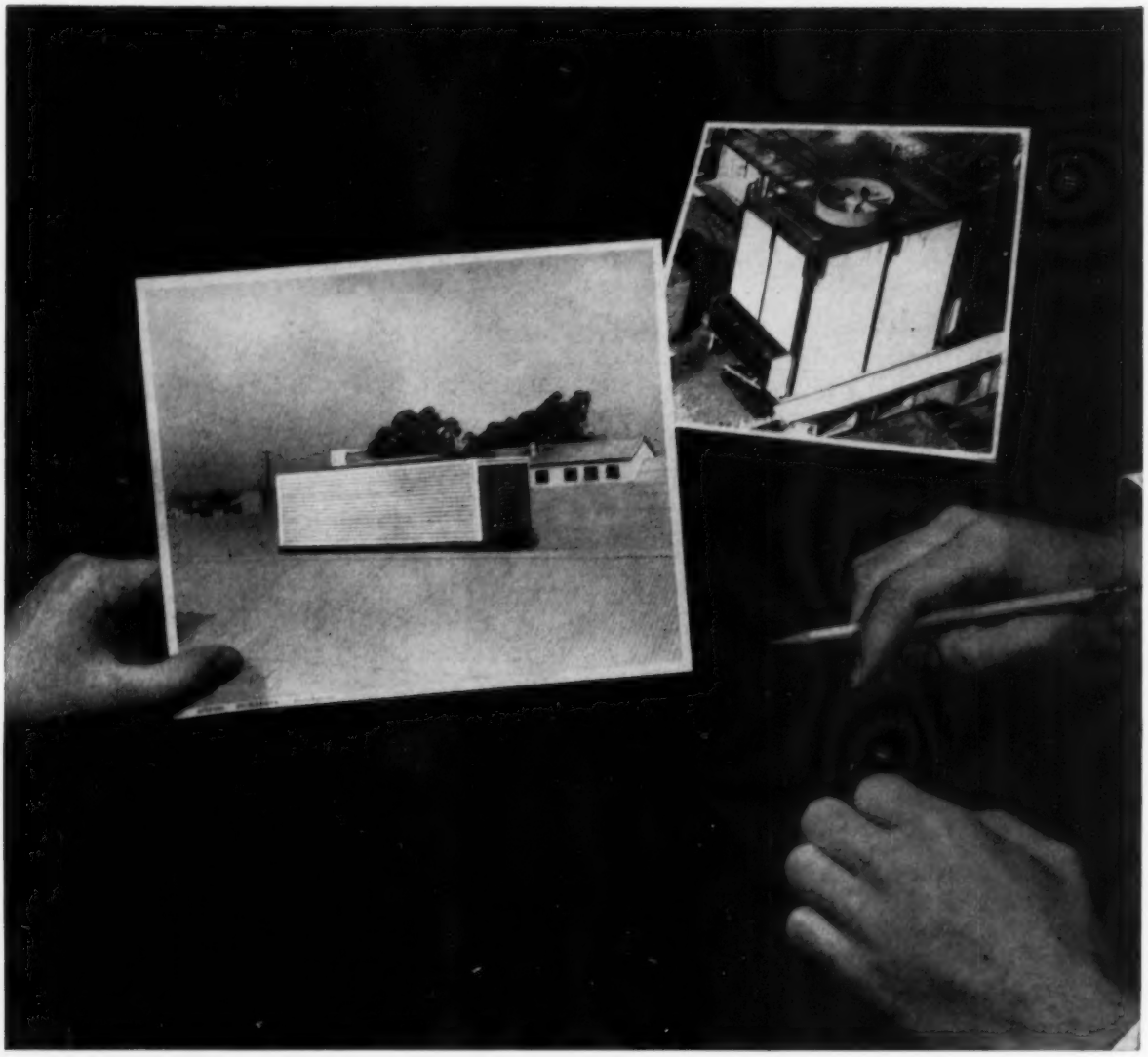
For complete information, write: L·O·F Glass Fibers Company, Dept. 39-46, 1810 Madison Avenue, Toledo 1, Ohio.

L·O·F GLASS FIBERS MICROLITE INSULATION

L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

Makers of glass fibers by the exclusive "Electronic-Extrusion" process



"There's just no comparison! This Pritchard LoLine answers our design problem!"

"When you said it had a low silhouette, you really meant *low!*"

"That's why we chose this Pritchard LoLine tower. You know, cooling towers have always been a problem to architects. We design a good looking building and then have to clutter up the design by putting a tall and unsightly tower on top of it."

"Well, this LoLine ought to make you fellows happy!"

"It makes everyone happy. The engineers like it because it's efficient, has an internal piping system and a performance record that can't be beat. The owners of the building are happy because of the low initial costs and the minimum maintenance."

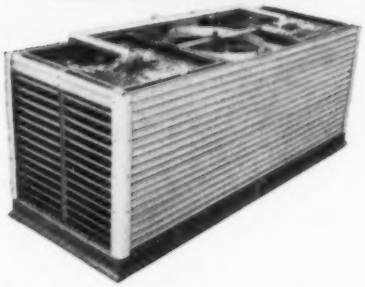
"It looks like the Pritchard LoLine is the answer to a lot of cooling tower problems."

"It is! Whenever there's a problem, you can always count on Pritchard to come up with an answer!"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.

"There's just no comparison! This Pritchard LoLine answers our design problem!"

Seven good reasons for choosing the LOLINE®



Pritchard LoLine Cooling Towers are better in seven important ways:

1. They have the lowest silhouette of any tower 75 tons and up. Over-all height is just 7' 7 11/16".
2. *Galvanized* steel fan drive supports and basin accessories; not cheap, less durable, painted steel.
3. Grease fittings for the V-belt drive bearings are brought to the outside of the tower. Greater safety, easier maintenance.
4. *Corrugated* asbestos cement board casing; not flat asbestos cement board sheets.
5. Asbestos cement board louvers are installed as standard, not special equipment.
6. Optional internal pipe supply system. Permits complete concealment of piping.
7. V-belt drive features a stainless steel fan shaft for far longer life.

WRITE FOR LOLINE BULLETIN

Send for bulletin No. 5.1.902. Tells you all about the framework and mechanical equipment, capacities, optional equipment, name and address of Pritchard sales office nearest you. Write for your complimentary copy today on your company letterhead!

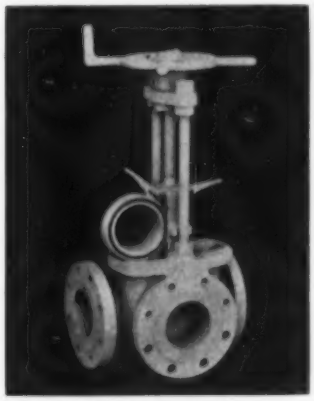
INDUSTRY'S PACEMAKER FOR PROGRESS

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 509, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS • GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

EQUIPMENT DEVELOPMENTS

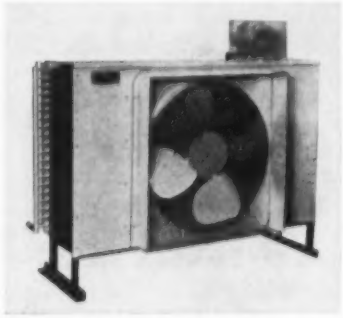
Continued



Visible Wedge Valve. . .

. . . in three new styles—*Hamer Valves, Inc., Dept. HPAC, Box* 1851, *Long Beach, Calif.*

Tee, horizontal ell, vertical ell have same center-to-face dimensions as standard tee and elbow pipe fittings. Body styles are said to provide all configurations necessary for modern piping, piping manifold requirements. Cited features are stability, safety, simplicity.



Blower Condensers . . .

. . . for operation of air conditioning, refrigeration systems without use of water—*Bush Mfg. Co., Dept. HPAC, West Hartford, Conn.*

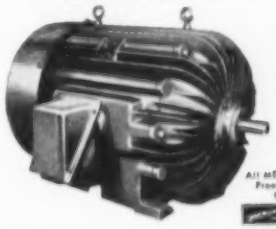
In capacities to 20 tons. Cited features are low noise level, ease of installation. Available with blower fan or propeller fan.

Condensate Pumps . . .

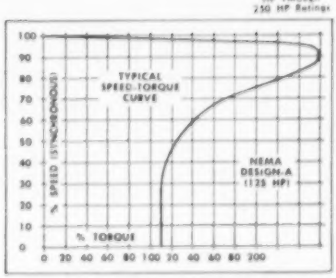
. . . added to company's line—*Sarco Co., Inc., Dept. HPAC, Empire State Bldg., New York* 1.

Furnished with 12 gal cast iron receiver. Capacities are 2000 to 8000

- **EXPERIENCE of PROVEN PERFORMANCE . . . . over HALF A CENTURY. There is no substitute for the reliability of proven performance. Top Names of the Nation's Industry have proven ME performance in ENGINEERING . . . DESIGNING . . . PRODUCING QUALITY PRODUCTS**
- **VERSATILITY with a WIDE RANGE OF DESIGN. MOTORS 1/20 thru 2500 HP . . . GENERATORS 1/2 thru 2000 KW . . . . Single Phase, Polyphase, Direct Current . . . Standard or Special . . . Marathon Electric can design to meet your special specifications.**
- **SERVICE THROUGHOUT the NATION MARATHON ELECTRIC has a DISTRICT OFFICE or Representative near you. Call your ME Representative TODAY to help solve your motor problem.**



All ME Explosion Proof Motors Carry Label in 1/12 HP Through 250 HP Ratings



EXPLOSION PROOF MOTORS

MARATHON ELECTRIC'S familiar ribbed frame construction has already been often copied but never duplicated. This carefully developed rib design formula has resulted in the COOLEST, CLEANEST, MOST EFFICIENT, and MOST COMPLETE RANGE of EXPLOSION PROOF MOTORS to carry the Underwriters' Laboratories Label. They are available in NEMA frame from 56 thru 680 series, from 1/12 thru 250 HP.

Write or Wire SPADE 70 for further information

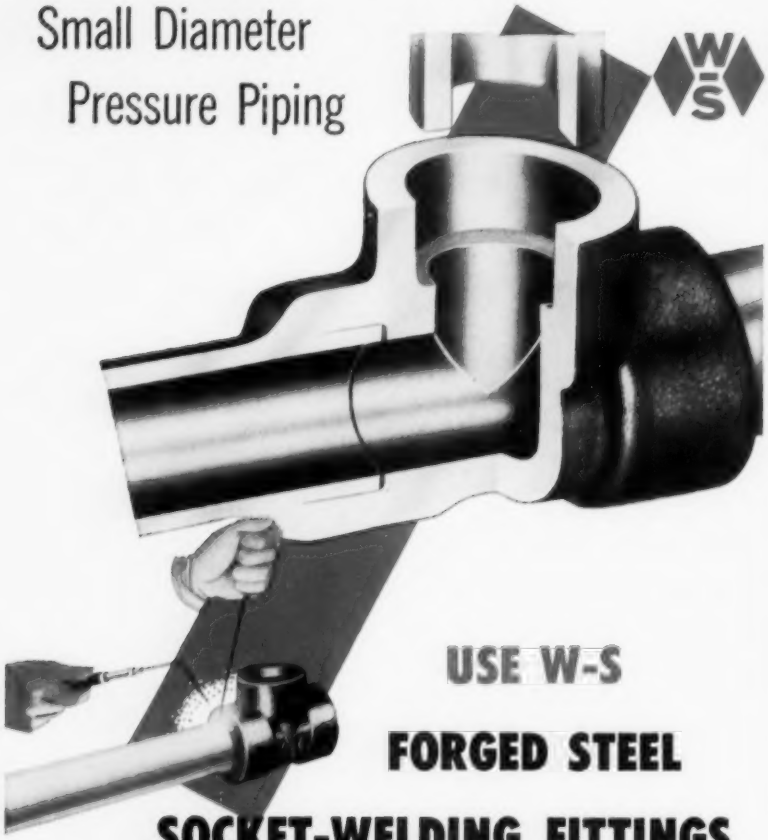
SALES OFFICES IN PRINCIPAL CITIES

MARATHON ME ELECTRIC

HOME OFFICE AND FACTORY, WAUSAU, WIS.
FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.

Here's the **EASY WAY TO WELD**

Small Diameter Pressure Piping



USE W-S FORGED STEEL SOCKET-WELDING FITTINGS

In addition to providing high strength and toughness, W-S Forged Steel Socket-Welding Fittings are also easy to install. Deep sockets support and align the pipe for welding . . . eliminating the need for tack welding or special fixtures. No back-up ring is needed either. The fillet-weld is completely outside the pipe. Welding icicles just can't form inside the pipe. The result is a clean, tight welded joint that will readily resist high pressures and the stresses of shock and vibration. What's more, installation costs are lower.

W-S Socket-Welding Fittings are available in sizes ⅛" to 4" for schedule 40, 80, 160 and double-extra heavy pipe in carbon steel, stainless steels and alloy steels.

For complete information on the installation and operation advantages of W-S Forged Steel Socket-Welding Fittings, send today for Bulletin A-3-56.

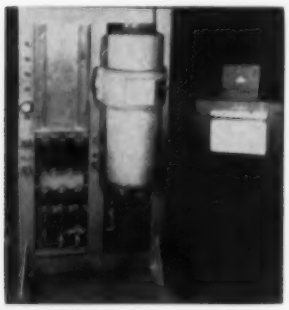
W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

EQUIPMENT DEVELOPMENTS

Continued

sq ft EDR and 3450 rpm. Easy to convert from single to duplex, says company. Cited features are: low 7½ in. inlet, mechanical seal, dynamically balanced enclosed bronze impeller.



Instrument . . .

. . . designed for measuring, recording low concentrations of water vapor in air or gas streams, which operates on thermoelectric principle—*Mine Safety Appliances Co., Dept. HPAC, 201 N. Braddock Ave., Pittsburgh 8.*

For continuous operation. Method, operating on 4 min measuring cycles, has been used in instruments with full scale range of 100 ppm water by volume and it now appears possible to operate with even lower full scale ranges, says company. Manufacturer reports sensitivity of 0.25 ppm by volume has been attained. Instrument designed as solution to moisture problems in process industries, gas pipelines.

Packaged Conditioners . . .

. . . with 10, 15, 20, 25, 30 ton capacities—*Alton Mfg. Co., Dept. HPAC, 1112 Ross Ave., Dallas.*

Designed for simplified installation in medium to large commercial establishments, small factories. Evaporative condenser built into unit. Con-

1906

Engineering marvel at the turn of the century ..."hi-fi" in the making. It was in 1906 that the first *Brunner-engineered* product appeared.

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50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

TODAY... Brunner experience pays off in more sales for you...

provides the most complete line of Air Conditioning Condensing Units available from a single source!

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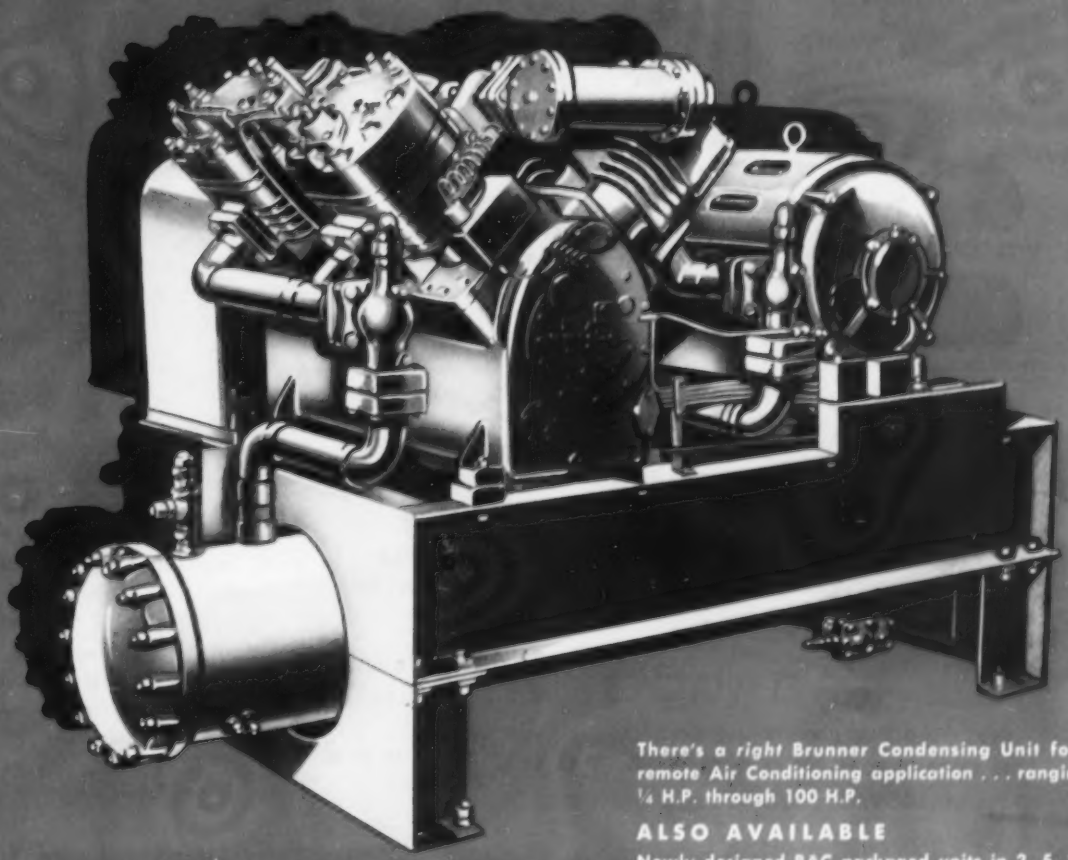
THE BRUNNER CO., GAINESVILLE, GA.
IN CANADA: BRUNNER CORP. (CANADA) LTD., TORONTO, ONTARIO



There's a right **Brunner Condensing Unit for every remote Air Conditioning application . . . ranging from ¼ H.P. through 100 H.P.**

ALSO AVAILABLE

Newly designed BAC packaged units in 3, 5, 7½ and 10 H.P., finished in Hammertone Green.

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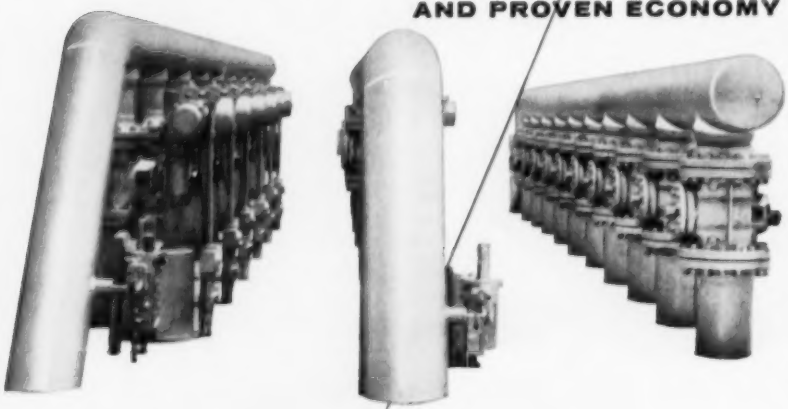
WELDOLETS

FOR ASSURED STRENGTH
AND PROVEN ECONOMY



WELDOLETS

THREDOLETS

SOCKOLETS

Are you effecting this economy for your company? Neat and uniform appearance is evident in code constructed weldolet headers in this crude oil pipeline terminal. The money saved is in the bank and does not appear in this picture. If you are not using the weldolet method of cutting piping costs, write today for information.

BONNEY

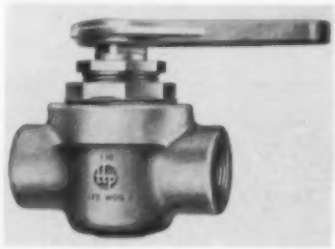
SOLD THROUGH LEADING DISTRIBUTORS

WELDING FITTINGS DIVISION
BONNEY FORGE & TOOL WORKS
715 MEADOW ST., ALLENTOWN, PA.

EQUIPMENT DEVELOPMENTS

Continued

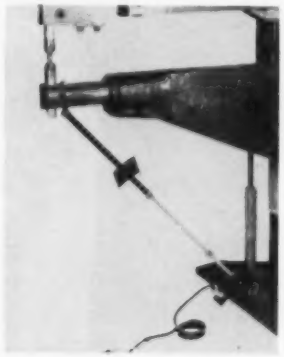
denser section consists of bare copper tubing, without fins to assure adequate air, water flow, says company.



Plug Valve . . .

. . . injection molded of polyvinyl chloride—*Tube Turns Plastics, Inc., Dept. HPAC, 2929 Magazine St., Louisville 11.*

"Self lubricated" unit designed to handle variety of corrosive fluids. Is said to reduce replacement costs and downtime, minimize purging, eliminate contamination problems in certain fluids resulting from metallic contact. Available in 1, 1½, 2 in. sizes.

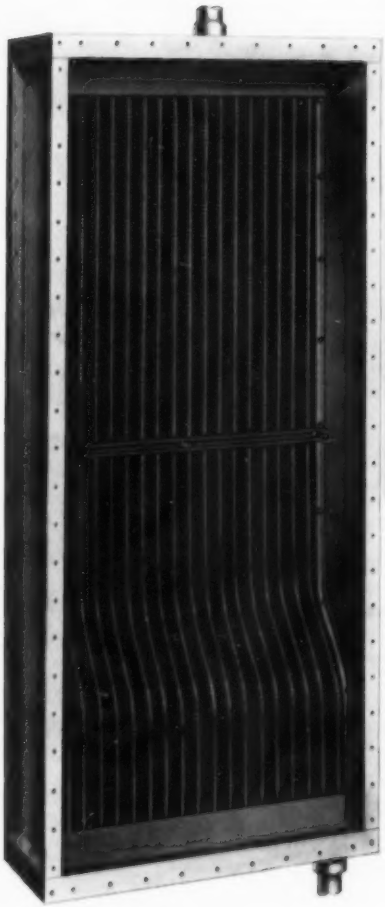


Force Gage . . .

. . . designed to make dynamic measurements on recording oscillograph of force changes between electrodes of resistance welding machines—*Sciaky Bros., Inc., Dept. HPAC, 4915 W. 67th St., Chicago 38.*

Unit is strain gage type, mounted on cantilever beam of nonmagnetic materials. Beam can be adjusted to accommodate machines with throat depths 12 to 60 in. May be mounted on spot or seam welders.

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



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Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

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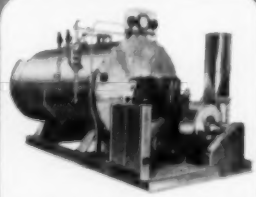
THERMOPAK

Another Great PREFERRED Automatic Combustion Package

Easiest to Install for 100% Automatic Operation on Heavy Oil or Gas

Next best to Preferred's famous induced draft Unit Steam Generator is the new Thermopak—a fully automatic combustion system that solves your problem in specifying and installing the right equipment for new or old boilers.

The Thermopak is not just an oil burner—but a completely engineered, factory assembled and tested, packaged unit with all controls and prewiring, to eliminate all complications of electrical installation and maintenance. It reduces combustion chamber requirements; simplifies fuel line hook-up.



For new boiler rooms or for added steam capacity—your BEST bet is a Preferred Unit Steam Generator – BEST of all "packaged" boilers in design, construction and operating economy. Built in 19 sizes from 20 to 600 B.H.P. 15 to 250 p.s.i., for oil, gas or combination fuels; factory fire-tested before shipment. Get Bulletin 2000.

Because of its unique design and method of preheating secondary combustion air, the Thermopak operates with very high combustion efficiency, far in excess of standard oil burner performance.

In Thermopak you buy one complete piece of dependable equipment from one responsible source—at lowest possible cost—with the assurance of easiest, simplest installation and positive user satisfaction.

The Thermopak burns any grade of oil, including #6, gas or in oil-gas combination. It is suitable for any fire- or water-tube boilers of 20 to 525 B.H.P.

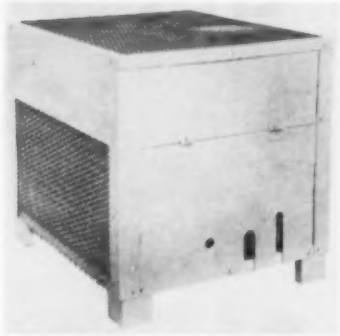
Investigate Thermopak. Write for Bulletin 185 to Dept. HP.

PREFERRED UTILITIES MANUFACTURING CORP.

1860 Broadway, New York 23, N. Y.

EQUIPMENT DEVELOPMENTS

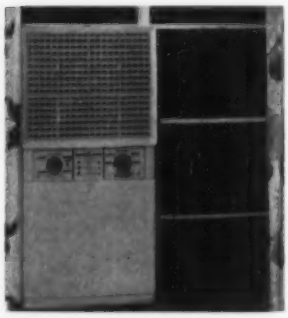
Continued



Air Cooled Condensers . . .

. . . in 2, 3, 5 ton sizes—*Coleman Co., Inc., Dept. HPAC, Wichita.*

Operate at dry-bulb temperature of air. Units have hermetically sealed compressors. Coils are copper with aluminum fins. Hinged door affords access to controls. Designed to be used with company's "Blend-Air" line of direct expansion plenum coils and vertical coolers.



¾ Hp Conditioner . . .

. . . for casement window installation —*Emerson Electric Mfg. Co., Dept. HPAC, 8100 Florissant Ave., St. Louis* 21.

Unit is featured in company's 1956 line. Has thermostat, two fan speeds, ventilation, exhaust, high power factor, says company. Line includes 11 units in "Deluxe," "Heat and Cool" and "Standard" series. Sizes range ¾ to 1½ hp.

Gas Flow Calibrator . . .

. . . designed as dual range instrument provided with two meter elements which may be individually connected to a single manometer—

ACCURATE IN SIZE AND TOPS IN QUALITY!

Chase® Type L Copper Tube!

It's a sure thing! Your heating, air conditioning and refrigeration equipment will deliver dependable, *peak performance over the years,* when you fabricate with Chase Type L copper tube!

Inside and outside diameters accurate to thousandths of an inch assure proper tolerances for fitting connections. That means extra-easy assembly of finned sections. Smooth interiors of tube and Chase solder-joint fittings insure a steady, even flow of heating or cooling liquids. And for extra cleanliness, you can get Chase Type L copper tube tightly capped at slight extra cost.

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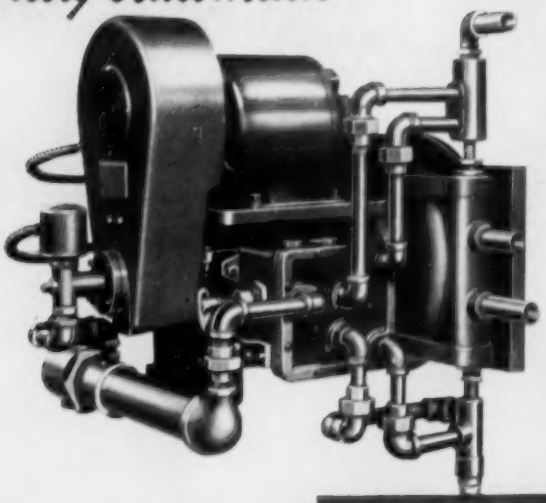
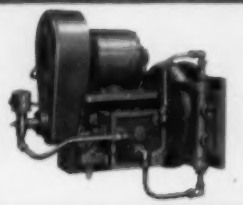


for No. 6 OIL

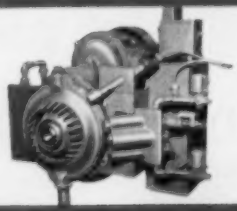
SUPERIOR ROTARY BURNERS

. . . provide dependable manual, semi-automatic, or fully automatic operation . . . burning light or heavy oils, natural or manufactured gas. For new installations and conversions in all types of heat receivers; for heat, process steam or power.

Developed primarily to achieve the complete combustion which results in the highest efficiencies with the greatest economy of fuel, these rugged burners insure years of dependable trouble-free operation. For complete details write for Catalog 2604.



for No. 5 OIL



for GAS/OIL

Note THESE SOUND FUNDAMENTALS:

- Time-tested horizontal-rotary design.
- V-Belt Drive for the high cup speed essential to efficient atomization.
- Four-Hole Hinge circulates oil through oil heater so that hot oil is on the *pressure* side of the pump, allowing you to burn oil at higher temperatures.
- Adjustable Air Nozzle provides accurate control of flame contour.
- Dual Pumps and Reservoir combined with Constant Oil Rate Control provide controlled firing regardless of viscosity variation.
- Burn any grade of oil. Also available with combined gas burner for any type of gas.
- Fully automatic in sizes to 600bhp with dual ignition, and hi-low or fully modulating control.

for performance you can **BANK** *on*

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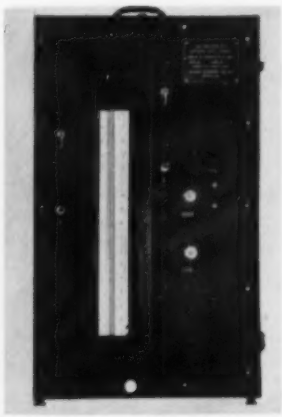
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR ROTARY BURNERS

EQUIPMENT DEVELOPMENTS

Continued



National Instrument Laboratories, Inc., Dept. HPAC, 6108 Rhode Island Ave., Riverdale, Md.

Flow measurements to 30 percent of full scale made with low flow element. High flow element used for rest of range.

Timer Valves . . .

. . . for "automatic" control of flow of liquids, gas, air—*Automatic Controls Corp., Dept. HPAC, 2390 Winewood, Ann Arbor, Mich.*

Units consist of solenoid valve and timer control sealed in water tight case. Designed to turn flow on or off at desired time intervals. Fit standard pipes $\frac{3}{8}$ in. and larger. Operate on 110 or 220 volts, 60 cycles.

Coupling . . .

. . . designed for installation without threading—*Guardian Products Corp., Dept. HPAC, 1204 E. Second St., Michigan City, Ind.*

"Quik-Joint" is said to reduce la-

8 GOOD REASONS for you to SPECIFY Acme for your wet heating-cooling systems

1. **Acme FLOW-COLD LIQUID CHILLER** — today's leading packaged chiller in the 3 to 20-ton capacity range. New compactness, new quiet V-type compressors — better and more versatile than ever.

2. **Acme FLOW-COLD COOLING TOWER** — the all-metal water-saver with powerful, quiet-running blowers that are built for more customer satisfaction and less upkeep than any other tower on the market. 6 sizes.

3. **Acme FLOW-TEMP HEAT PUMP** — the unit that's been successful as a source of economical, year 'round comfort — heating and cooling — in a wide range of climates.

4. **Acme FLOW-TEMP ROOM CONDITIONERS** — one of a complete new line of remote room conditioners that offers a style for every installation — floor or ceiling mounted, cabinet-type or concealed.

5. **PROVEN PERFORMANCE** — every unit in the Flow-Cold, Flow-Temp line has been field tested and proven. Your jobs go smoothly when you specify Acme.

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8. **100% Acme BACKING** — Over 36 years of experience in the field and one of the industry's most progressive sales policies stands behind every Acme product you buy.

5 PROVEN PERFORMANCE
6 EASY, ECONOMICAL INSTALLATION
7 A COMPLETE LINE
8 100% Acme BACKING

ACME INDUSTRIES, INC. JACKSON, MICHIGAN

Send me complete details on Acme Flow-Cold, Flow-Temp line.

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Company _____

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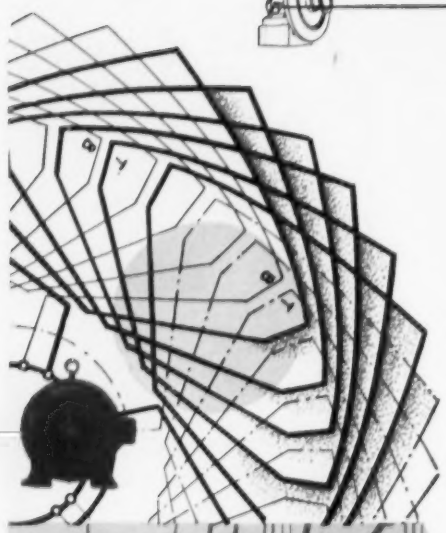
City _____ Zone _____ State _____

a better kind of power

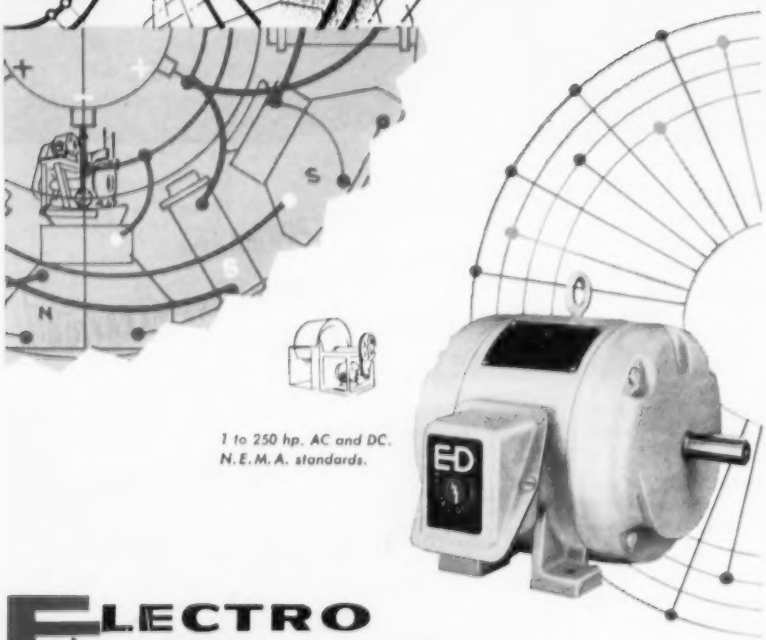
FOR INDUSTRIAL MACHINES

ED ELECTRO DYNAMIC

The mark of an **E**xtra **D**ependable machine



From America's foremost producer of custom designed motors come these premium-built, *extra dependable* E.D. "power packages "for general industrial use—75 years in the making—yours today *at no extra cost!*



1 to 250 hp. AC and DC. N.E.M.A. standards.

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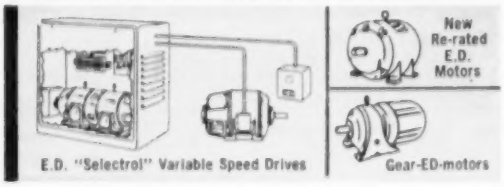
NEW...

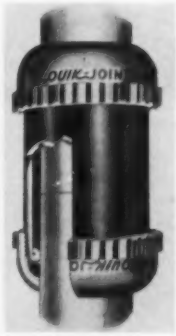
Write for Brochure 100 and literature on new E.D. motors and drives.

Electro Dynamic division of General Dynamics Corporation Bayonne, New Jersey



EQUIPMENT DEVELOPMENTS

Continued



bor costs to 50 percent. Unit is slipped over unthreaded ends of pipe, tightened with ordinary pipe wrench. Can also be used to repair leaks, says company, by cutting pipe at leak, installing coupling to join cut ends. For working pressures to 2000 psi.

Air Eliminator . . .

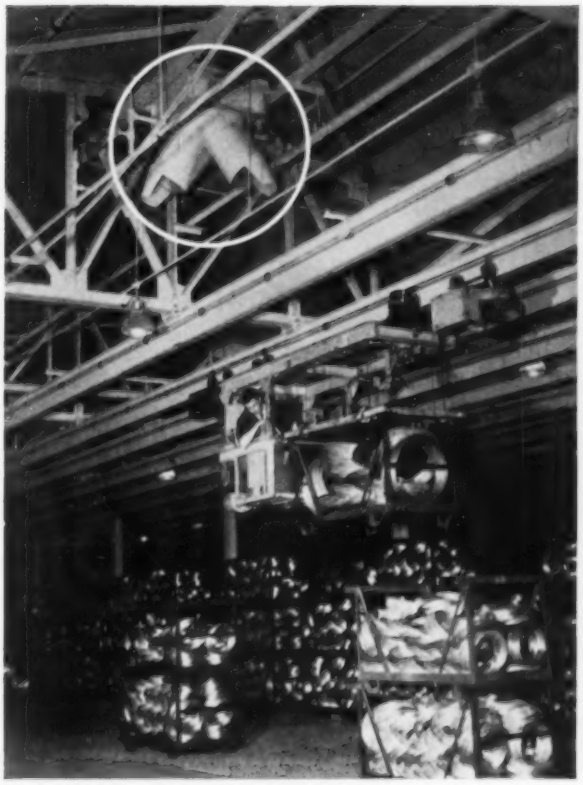
. . .for steam pressures 0 to 150 psi —*Gorton Heating Corp., Dept. HPAC, Cranford, N. J.*

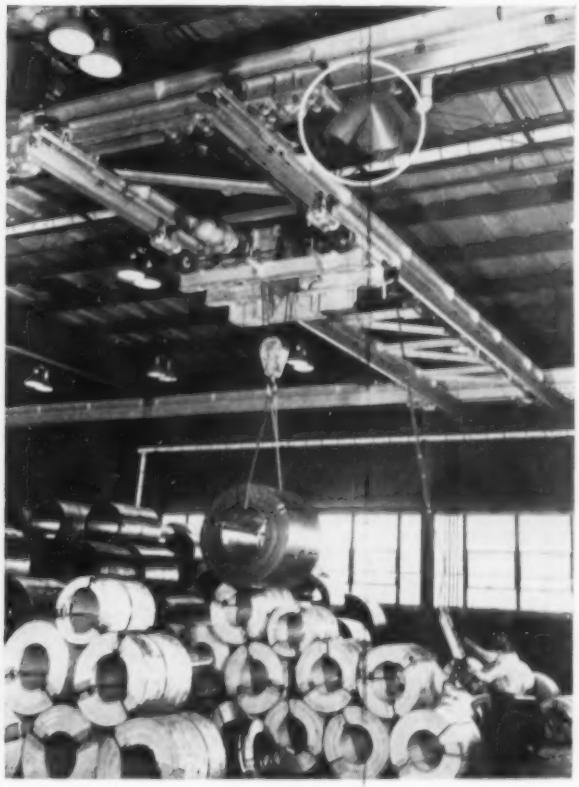
"No. 12 High Pressure" designed for fast venting, automatic closing on steam processing equipment such as steam coils, steam mains, unit heaters, laundry equipment, etc.

Pin Bolt Drives . . .

. . . for anchoring applications by heating, piping, air conditioning contractors, maintenance and service men, etc.—*J. D. Polis Mfg. Co., Dept. HPAC, 2900-20 W. 26th St., Chicago 23.*

Designed for easy installation. Ex-





Here's Proof of the Complete and Even Distribution of Heat by Wing Revolving Heaters

Gently Circulating Heated Air Keeps Valuable Steel Coils from "Sweating"

ONE of the problems of storing large rolls of steel strip is variation in storage room temperature that results in "sweating" and consequent corrosion. In one large eastern steel mill where such sweating was going on, resulting in costly corrosion, the problem was solved by replacing ordinary heaters used for heating the building with Wing Revolving Unit Heaters. The constant slowly moving streams of heated air circulate around and through the stacked coils of steel strip, keeping them always at a uniform temperature. Since installing the Wing Revolving Heaters, they have never lost a coil through corrosion!

Your problem may not be corrosion, but the same even gentle movement of heated air will do as much for you in increased comfort for your workers. (Winter and summer, for your workers will be equally pleased with the cooling effect of these "heaters" on a hot day—with the steam off and fans and revolving discharge outlets working.) For medium and low ceiling heights as well as for high ceilings. This is modern industrial heating. Investigate by writing for a copy of Bulletin HR-6A.

Wing

REVOLVING HEATERS

L. J. Wing Mfg. Co. 140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N.J. and Montreal, Can.

WING DRAFT INDUCERS

WING BLOWERS

WING FANS

WING TURBINES

Mail the coupon for bulletin

L. J. Wing Mfg. Co. HP-4
140 Vreeland Mills Rd., Linden, N.J.

Please send me Bulletin HR-6A—Revolving Heaters

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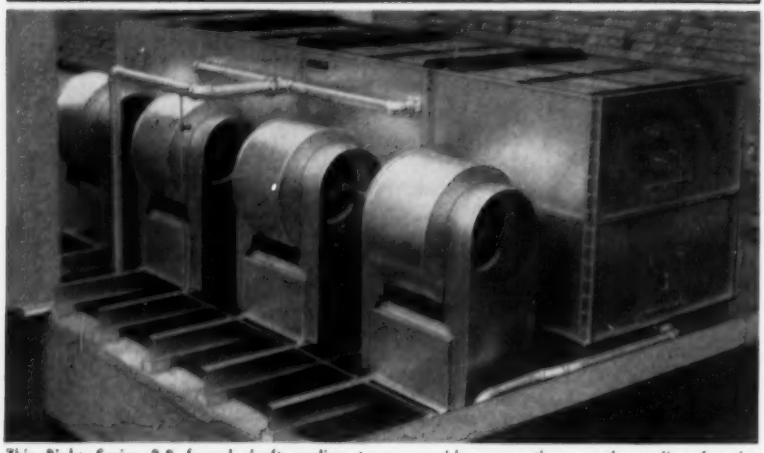
City ..... Zone ..... State .....

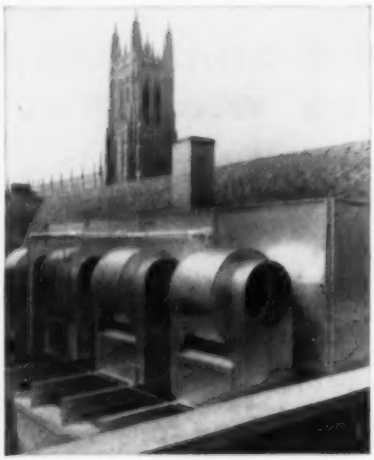
COOLING TOWER NEWS



This Binks Series 3-B forced draft cooling tower provides more than ample cooling for the 160 tons of air conditioning needed for this university chapel...and does it extremely quietly.

Quietness and compactness win contract for Binks Cooling Tower

Leading Southern University picks Series 3-B Tower for chapel roof.



The compact design and low silhouette of this tower keeps it out of sight from street level.

These modern forced draft, low silhouette, cooling towers featuring the dry blower air propulsion system, are designed for use where high cooling efficiency is demanded, combined with whisper-quiet performance and compactness. Squirrel cage blowers supply ample air movement at tip speeds far less than noisy propeller-type fans.

High cooling efficiency is obtained due to thorough water break-up from Binks patented Rotojet nozzles, combined with internal redwood nailless decking. They also feature counter-current operation with air movement in opposite direction to water flow.

Heavily galvanized, these towers reduce maintenance to a minimum. Interior surfaces are fully sprayed with a tough mastic coating. The air propulsion assembly is located in the dry air stream to protect it from corrosion. Series 3-B towers are completely shop fabricated, ready for easy assembly.

FOR FULL INFORMATION about Binks complete line of natural and mechanical draft cooling towers, write direct to the address below. Binks engineers will gladly help you select the right tower for your specific needs.

Binks
EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

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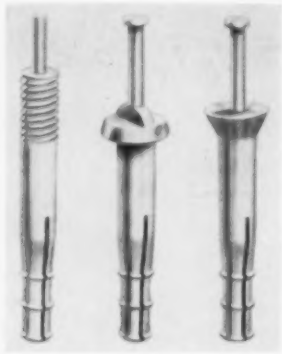
136-55

EQUIPMENT DEVELOPMENTS

Continued



panded by driving drive pin. In round, flat, stud head types. In six lengths with ¼ in. diameter.

Hack Saw Frame . . .

. . . designed for use in close quarters —*Clemson Bros., Inc., Dept HPAC, Middletown, N.Y.*

Frame is of single member construction with plastic handle molded onto steel. Tool adjusts to 10 or 12 in. blades. Cam action lever lock is said to insure proper tension on either size.

Equipment Briefs . . .

BLACK PAINT formulated to protect surfaces subjected to temperatures to 750 F—*Spreco, Inc., Dept. HPAC, 7308 Associate Ave., Cleveland 9.* Is composed of black pitch base with silicone additive. Combination is said to form heavy bodied coating that does not blister, become brittle when exposed to varied temperatures, smoke, fumes, mild industrial acids, alkalis, moisture.

Specify RECO

WHEN SWANK, INC. CHOSE RECO INSTANTANEOUS HEATERS, they had 4 major requirements: Top Quality, Fair Price, Dependable Performance and Quick Delivery. RECO met all 4 and the Instantaneous Heaters selected are turning in fine no-maintenance service. Let RECO's full line of Instantaneous Heaters and Heat Exchangers solve *your* hot water problems, too. SPECIFY RECO.

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Architect - Lockwood Greene Engineers, Inc.
Consulting Engineer - W. B. Parsons, Co.
Mechanical Contractor - Swank, Inc., Maintenance Division

RECOgnized for superior quality in 48 states and 16 foreign countries.

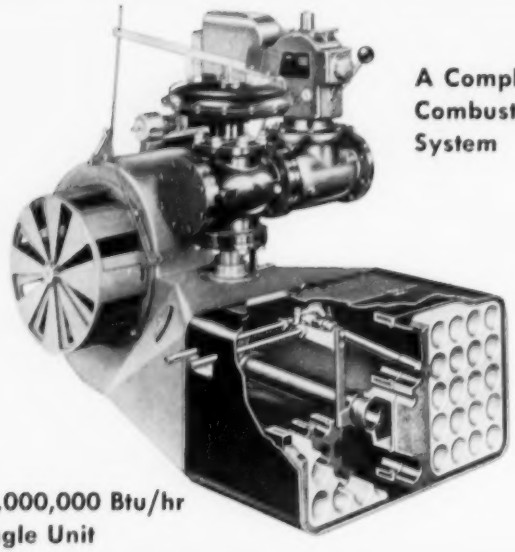
RECOmmended by leading engineers, contractors and architects.

RECO Hot Water Storage Heaters, Convertors and Instantaneous Heaters.

For free catalogs and the name of the RECO Representative nearest you, write:
Richmond Engineering Co., Inc., Dept. C, 7th & Hospital Streets, Richmond 5, Va.—Phone 7-2611

Richmond Engineering CO., Inc.

PACKAGED POWER
"FAN-AIR" BURNERS



A Complete Combustion System

25,000,000 Btu/hr Single Unit

- Completely packaged . . . nothing else to buy or install
- Tested and adjusted for jobsite conditions prior to shipment
- Smooth, noiseless combustion with minimum excess air
- Wide turndown range with no danger of flashback
- More uniform and effective heat distribution
- Natural draft operation during power failures
- Least expensive installation
- Requires less stack and furnace draft
- Built to exceed standards of all approval agencies
- Complete burner shutdown following flame failure
- Mettler patented spark-ignited rectifier safety pilot, with dependable electronic flame safety relay
- Available with steam, pressure, or air atomizer for burning heavy oils in combination-type unit

Write for new Catalog and Specifications
Bulletin G-200-B describes exclusive "Fan-Air" features, accessories, pilot operation, and major specifications of burners ranging from 400,000 to 25,000,000 Btu input. Write for copies, today!

THE METTLER CO., INC.
Division of ECLIPSE FUEL ENGINEERING CO.
4366 Worth Street, Los Angeles 63, California

Eclipse

EQUIPMENT DEVELOPMENTS

Continued

PROPANE FIREPOT with lightweight, portable design—*Otto Bernz Co., Inc., Dept. HPAC, 280 Lyell Ave., Rochester 6, N.Y.* Is said to light instantly. Uses disposable gas cylinder. Will melt, maintain 6 in. pot of lead for 4 hr, says company.

MERCURY PLUNGER TYPE RELAY engineered for small size—*Ebert Electronics Corp., Dept. HPAC, 212-26 Jamaica Ave., Queens Village 28, N.Y.* "Minirelay" can handle loads to 20 amperes or 1 ½ hp at 115 volts, 50/60 cycles, says company. Measures 3½ × 1 ¾ × 1 ½ in. Designed for compact multiple arrangements, ease of installation.

MAGNETIC CLUTCH designed to require no electric current for operation except for impulse for engaging, disengaging—*Locke Machine Co., Dept. HPAC, 971 E. 63rd St., Cleveland 3.* Manufacturer sees potential in air conditioning field. Will be available in fractional horsepower range and for larger applications, also, says company.

PIPE DOPE with Teflon base formulated to minimize seizure, galling—*Eco Engineering Co., Dept. HPAC, 12 New York Ave., Newark 1.* "T-Film®" recommended by company both as pipe sealant for corrosive or hazardous fluids, as anti-seizing agent for use with alloys that gall readily.

ELECTRODE for tungsten inert gas welding—*Tungsten and Chemical Div. of Sylvania Electric Products, Inc., Dept. HPAC, 1740 Broadway, New York 19.* New 2 percent thoriated electrode is said to give easy arc starting, provide stable arc, have high current capacity and longer life, have high resistance to weld pool contamination.

CAULKING COMPOUND for refrigeration service—*J. W. Mortell*

General Contractor: Cauldwell Wingate Co.
Heating & Ventilating Contractors: Raisler Corp.
Architects: Kelly & Gruzen
Contracting Engineers: Jaros, Baum & Bolles

845 feet of steam, condensate and return lines run from college power plant to science building (background). Note spot-welded rods prevent pipes from shifting on supports while pipes are being laid.

Another university approves GILSULATE® for hot underground pipe insulation

Albert Einstein College of Medicine in New York City, the newest of American medical colleges, chose GILSULATE to insulate and protect 845 feet of pipe running from its power plant to its basic science building.

Covered by 138 tons of GILSULATE—with only six men doing the job—are a 10-inch 185-pound steam supply line; 2-inch high pressure return; and a 6-inch condensate line. Pipes were surrounded with an 8-inch envelope of GILSULATE, except under roads and driveways where thickness was increased to 11 inches.

GILSULATE was approved because no other insulation for hot underground pipes could match it in corrosion protection and low cost of installation. It will pay you to investigate this revolutionary material for your next piping job. Fill in the coupon below for more details.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp... pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE**:
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

Inexpensive plywood forms were put up to confine the GILSULATE to the area required and cut down on tonnage needed. Men in background are in front of one of the four access chambers.

138 tons of GILSULATE were poured and tamped around the pipes by six men in good time—which included a two-mile truck haul from a railroad siding to the job site. Type B GILSULATE was used—the three protective zones were formed in eight hours.

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
124-B West Broadway, Salt Lake City 1, Utah — or — 1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
HPA

EQUIPMENT DEVELOPMENTS

Continued

Co., Dept. HPAC, Kankakee, Ill. Packaged in cylindrical containers for handling ease. Caulking cord comes with three 16 ft rolls to container and can be unwound one or more strands without unwinding entire roll. Caulking gum is put up in 1 lb slug.

SAFETY HOIST HOOKS designed for convenience, reliability, long life—*J. H. Williams & Co., Dept. HPAC, 400 Vulcan St., Buffalo* 7. Latches are said to have powerful noncorrosive snap springs. Loads cannot be jarred from hook, says company. Latches are of sufficient size to allow operator ample gripping area so that fingers are not exposed to load carrying line.

O-RING SEAL for fuel oil service —*Rubber Products Div., Parker Appliance Co., Dept. HPAC,* 17325 *Euclid Ave., Cleveland* 12. Molded from synthetic rubber compound. Is said to have undergone exacting tests with six different fuel oils.

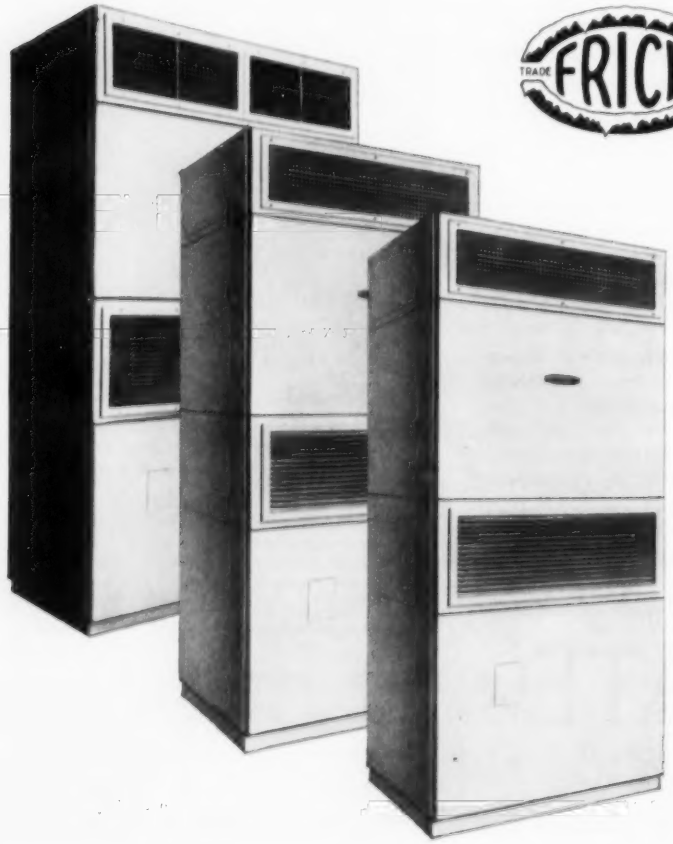
CONTACT SWITCH KIT for planning, building, repairing, testing electrically operated controls—*Guardian Electric Mfg. Co., Dept. HPAC,* 1621 *W. Walnut St., Chicago* 12. Is said to provide all components necessary for assembly of variety of contact switch combinations. Kit includes compartments containing assortments of components.

SOLDER-FLUX PASTE in plastic squeeze bottle—*Anchor Metal Co., Inc., Dept. HPAC,* 244 *Boerum St., Brooklyn* 6. "Redi-Mix" is said to eliminate need for separate flux, solder. Speeds up production and individual soldering of parts, says company.

CEMENT for joining polyvinyl chloride pipe fittings, flanges—*Tube Turns Plastics, Inc., Dept. HPAC,* 2929 *Magazine St., Louisville* 11. Joints are said to be as strong or stronger than pipe itself. Will bridge great diametral gap, says company.

GAMMA RAY PROJECTOR for radiographing high pressure vessels —Manufactured by *M. W. Kellogg Co.* Sales agent is *Metal & Thermit Corp., Dept. HPAC,* 100 *E. 42nd St., New York* 17. Designed to detect possible flaws in vital welds. With shutter closed, shielding is said to be so thorough that men can work close to unit in safety.

OVERHEAT DETECTOR THERMOSTAT designed for equipment where warning signal is necessary—*Vapor Heating Corp., Dept. HPAC, 80 E. Jackson Blvd., Chicago* 4. Weighs 1 oz. Is said to light warning signal in less than 4 sec after overheat condition takes place.



FRICK TRADE MARK

Unit Air Conditioners

Have built into them 50 years' experience in conditioning air, 74 years' experience in refrigeration, and 103 years of successful engineering. Frick unit air conditioners installed in 1938 are still in service—and good for a long time to come.

These superior units are furnished in sizes of 3, 5 and 7½ hp. They have heavier (quieter) cabinets, well insulated; larger cooling surfaces; insulated condensers; conservative ratings; and many other advantages. All are shown in Bulletin 522. Your copy is waiting: write today.

Some desirable territories still open for qualified Distributors.

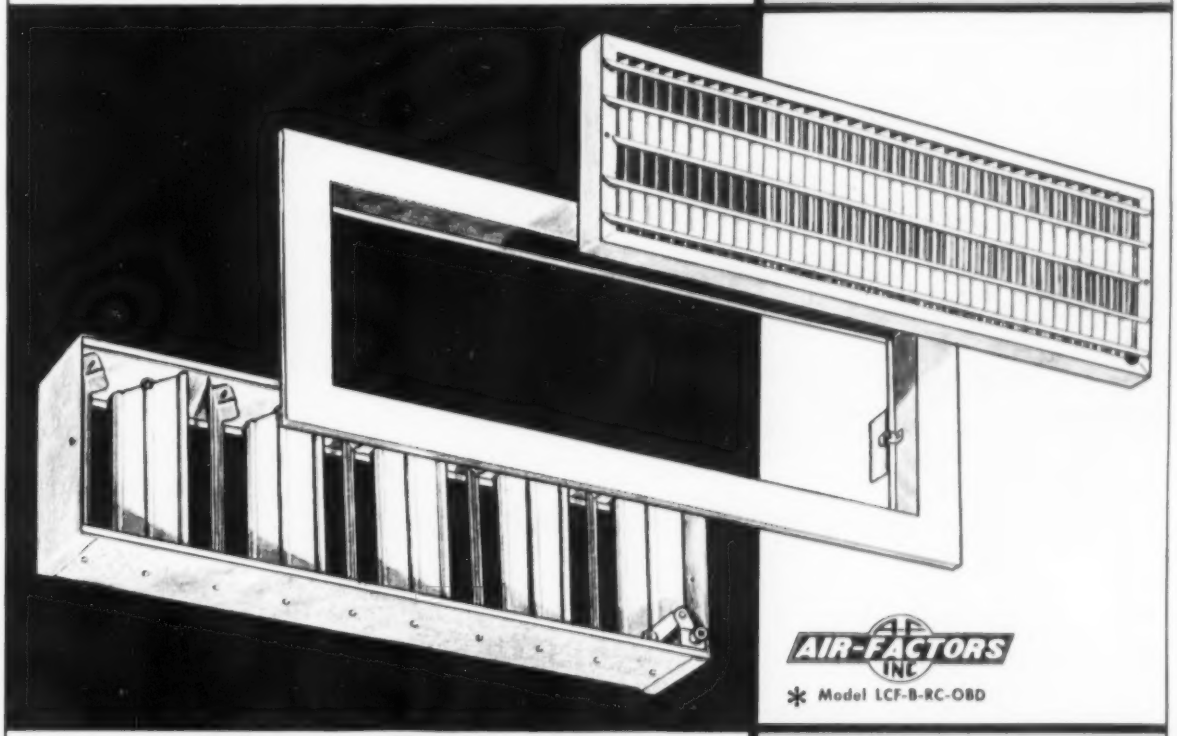
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

FOR BETTER AIR DISTRIBUTION

THE FIRST REQUIREMENT OF AN AIR DIFFUSER IS TO MIX THE SUPPLY AIR WITH THE ROOM AIR OUTSIDE THE ZONE OF OCCUPANCY.



AIR-FACTORS INC

* Model LCF-B-RC-OBD

Series LCF-B

LAMINAR COUNTER FLOW

fulfills this responsibility plus these additional features

- Roll formed steel mounting frame.
- Removable core.
- Egg crate air straightening core.
- Flexible vertical air diffusing vanes.
- Flexible horizontal air deflecting vanes.
- Key operated air volume control.
- Sponge rubber gasket.
- Baked on enamel.

* LAMINAR COUNTER FLOW AIR DIFFUSER WITH HORIZONTAL EXTENDED AIR DEFLECTING VANES — REMOVABLE CORE AND KEY OPERATED OPPOSED ACTING BLADE AIR VOLUME CONTROL.

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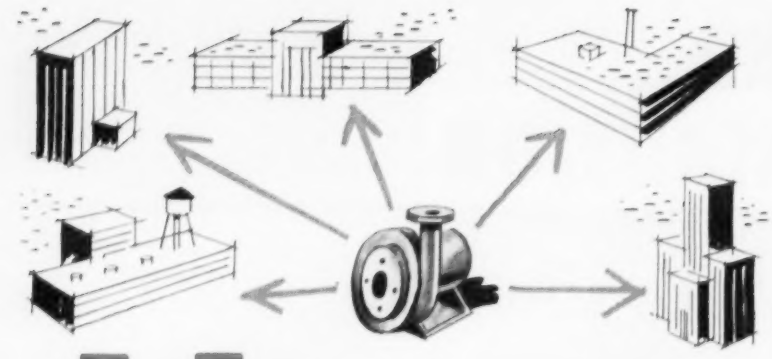
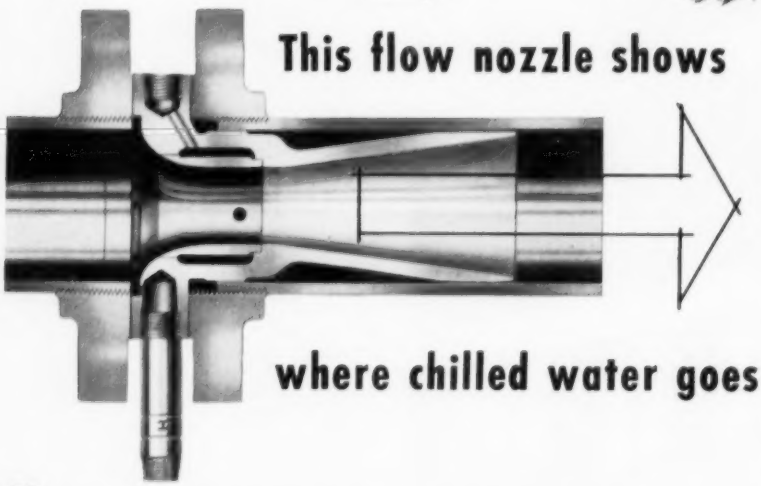
AIR-FACTORS INC

1624 South Raymond Ave.

Monrovia, California

MANUFACTURERS OF MOST COMPLETE LINE OF AIR DISTRIBUTION EQUIPMENT





BIF Builders-Providence, Inc., leading manufacturer of flow nozzles and tubes, offers the Model NZIF Insert Nozzle as a real money-maker in air conditioning systems. Commercial buildings, shopping centers, and other multiple occupant buildings find this precision nozzle the ideal metering element for accurate measurement of chilled water usage.

Here's why this flow nozzle is so widely accepted:

PRESSURE/TEMPERATURE PROOF: insert design withstands same pressures and thermal shocks as pipe itself.

ENDURING ACCURACY: precision machining throughout bronze throat liner and contoured inlet. Perpendicularly drilled and reamed piezometer taps.

LOW HEAD LOSS: efficient Venturi outlet cone assures high pressure-head recovery — permits use of smaller pumps, motors, piping.

EASY INSTALLATION: pressure taps are built-in . . . no special measurements or machining required in field.

MULTIPLE THROAT VENTS: for accurate metering even with upstream flow disturbances.

Bulletin 130-K3A gives complete dimension, capacity, and other data . . . shows how easy it is to install this efficient flow nozzle . . . gives detailed accuracy and pressure recovery information. Write for your copy to BUILDERS-PROVIDENCE, INC., 381 Harris Ave., Providence 1, Rhode Island.

BIF **B-I-F INDUSTRIES**
PROVIDENCE, RHODE ISLAND
BIF METERS FEEDERS CONTROLS

EQUIPMENT DEVELOPMENTS

Continued

PROCESS PACKING designed to "meet needs of an entire plant" — *Flexrock Co., Packing Div., Dept. HPAC, 3603-K Filbert St., Philadelphia 1.* Is said to eliminate stocking many different sizes, shapes, types. With self forming, self lubricating design.

AIR OPERATED UTILITY HAMMER with "stop rotation" feature for alternate use as rock drill or cement chipping hammer—*Thor Power Tool Co., Dept. HPAC, Aurora, Ill.* External cam lever permits change from rotative to straight hammering action. Hammer cuts round holes to 1⅝ in. diameters.

FLUOROCARBON PLASTIC COATINGS for outside chemical storage tanks to 1000 gal capacity—*M. W. Kellogg Co., Dept. HPAC, 225 Broadway, New York 7.* Coatings based on company's "Kel-F" dispersions. Dispersions are finely divided fluorocarbon plastic solids in volatile medium. Applied by spray, dip or spread coatings, are fused by heat into tough, impervious coating, says company.

MOTOR MOUNTS with spiral design—*E. H. Titchener & Co., Dept. HPAC, 67 Clinton St., Binghamton, N. Y.* Principal member of mount assembly is wire cross welded to support wires. Continuous spiral design is said to eliminate butt welding, swaging operations formerly required on each individual ring.

TOP for external gas vent openings—*William Wallace Co., Dept. HPAC, Belmont, Calif.* Designed to solve problems of nesting birds, accumulating debris. New version includes interior grille engineered to bar small birds from entering vent outlet. Also acts as filter to prevent twigs, leaves, other objects from clogging opening, says company. In sizes 3 to 8 in. diameter. ≠

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PRECISELY ACCURATE

Draft Control

for coal fired, oil fired, gas fired or gas-oil fired

HEATING PLANTS

FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28" and 32" sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6" through 24" sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.

FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8" through 32" for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Gate	Thickness of Parts Side Plates	Ring	Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	⅝ x 2"	22 Ga. Galv.	19#
16 M&MG	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	28#
18 M	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	35#
20 M&MG	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	41#
24 M&MG	14 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	65#
28 M&MG	14 Ga.	14 Ga.	¼ x 4"	14 Ga. H.R.S.	110#
32 M&MG	14 Ga.	14 Ga.	¼ x 4"	14 Ga. H.R.S.	140#

field

FIELD CONTROL DIVISION

of H. D. CONKEY & COMPANY, Mendota, Ill.

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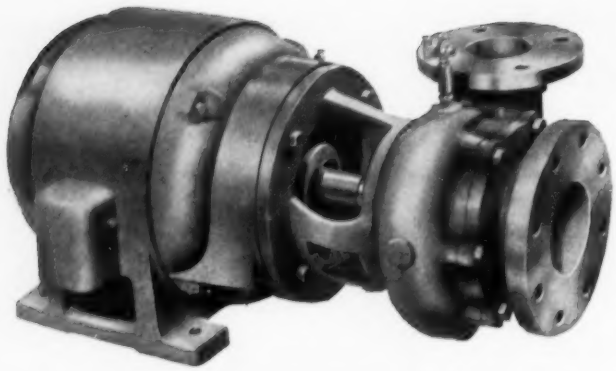
See our complete new exhibit at the National Oil Heat and Air Conditioning Exposition at the New York City Coliseum, June 11-15, 1956. Space No. 246.



WHERE A "BUFFALO" CLOSE-COUPLED PUMP IS YOUR BEST CHOICE

1. *Where space is limited,* "Buffalo" CCL Pumps are unequalled for compact design with high capacity. For example, a 4" pump with 15 HP motor, takes up less than 2 cu. ft., yet delivers 600 gpm at 60-ft. head.

2. *Where "package" installation is desirable,* you have a ready-to-run unit with shaft permanently pre-aligned for fast, simplified installation on the site or as part of original equipment. Readily adjustable to 4 discharge positions.

3. *Where you want high efficiency,* you will find these pumps up to the high performance standards of all "Buffalo" Pumps.

4. *Where you want durability and freedom from troubles,* "Buffalo" Close-Coupled Pumps are an ideal choice. They are built to take punishment — with heavy cast mounting brackets, rugged shell, husky, accurately machined impeller, large diameter shaft and stuffing boxes holding at least 8 rings of packing. Side plate (inlet) is readily removable to give access to rotor. You have a husky, easily serviced unit.

These and other "Q" Factor* advantages are yours in any clear water service up to 1100 gpm, when you specify "Buffalo" Close-Coupled Pumps. Write for Bulletin 975 for full details.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo" PUMPS

BUFFALO PUMPS

DIVISION OF BUFFALO FORGE COMPANY

171 MORTIMER ST. • BUFFALO, N. Y.

Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

RECENT TRADE LITERATURE . . .

▸ *COAL HEAT FOR SCHOOLS*—New 62 page booklet, *Automatic Coal Heat for the Nation's Schools,* is case history containing recommended plans for ideal boiler room design. *National Coal Association, Dept. HPAC, Southern Bldg., Washington 5, D. C.*

▸ *TIME DELAY RELAYS*—Bulletin TD 402 describes operation, specifications of time delay relays designed with proportional delayed reset. *A. W. Haydon Co., Dept. HPAC, Waterbury, Conn.*

▸ *SILENCING SYSTEM*—Brochure describes "Q-Duct" silencing system for air conditioning, ventilation installations. Discusses various applications. *Industrial Acoustics, Inc., 341 Jackson Ave., New York 54.*

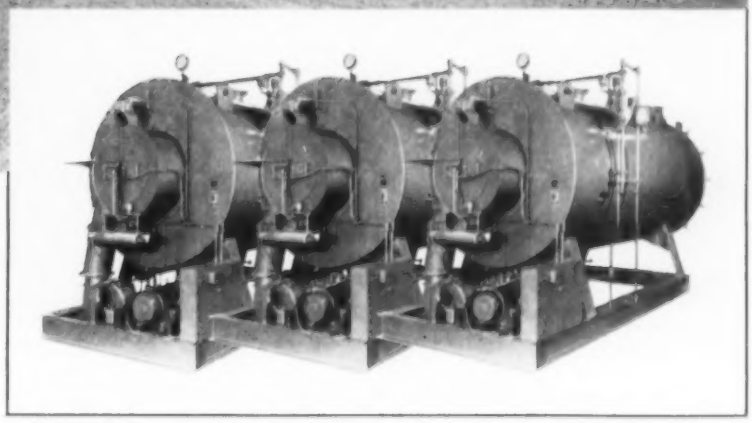
▸ *VALVES*—Direct operated water pressure reducing valves detailed in new 4 page bulletin. Literature describes features, lists sizes and capacities. *Spence Engineering Co., Inc., Dept. HPAC, Walden, N. Y.*

▸ *LIQUID CHILLERS*—Bulletins 220-B and 600-A cover company's "Flow-Therm" liquid chillers and "Dry-Ex" liquid chillers, respectively. *Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

▸ *FITTINGS*—New 2 page bulletin details line of metal pipe fittings for pneumatic materials handling systems. Includes dimensional drawings, tables. *Allen-Sherman-Hoff Co., Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

▸ *RELIEF VALVES*—Pressure, temperature relief valves for domestic hot water heaters, boilers, tanks and line of floor and ceiling plates and radiator air valves discussed in 4 page catalog. *Beaton & Cadwell Mfg. Co., Dept. HPAC, New Britain, Conn.*

This Multi-million dollar Shopping Center is a *Nickel Spender* for heat and power



Recently completed O'Neil-Sheffield Shopping Center in Sheffield Township, Ohio.

Architects: Weinberg and Teare, Cleveland, Ohio.

Consulting Engineers: Superior Engineering Company, Cleveland, Ohio.

Heating Contractor: T. O. Murphy, Oberlin, Ohio.

York-Shipley Distributor: Allied Oil Company, Cleveland, Ohio.

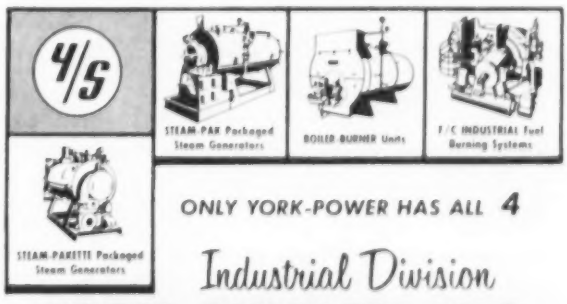
. . . thanks to three York-Power Steam-Pak Generators that operate only as the load demands

The larger the project, the more accurately you've got to figure operating costs—so argued the Architects and Engineers responsible for the mammoth O'Neil-Sheffield shopping center illustrated above.

With inefficient equipment, these men realized their heating costs might easily get out of hand. For this reason, they specified and installed thrifty, efficient York-Power Steam-Paks.

The 39 stores in this modern shopping center are hooked into a heating circuit powered by 3 York-Power SPW400-6 Steam-Paks. They are equipped with full modulation and each cuts in automatically *only as the load demands.* Under ordinary conditions, only one generator is required for the entire operation.

Find out how York-Power units can mean maximum economy and efficiency for your installation. You can depend on your nearest York-Shipley Representative for full cooperation. Call him today.



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Industrial Division

YORK-SHIPLEY, INC.

YORK, PENNSYLVANIA

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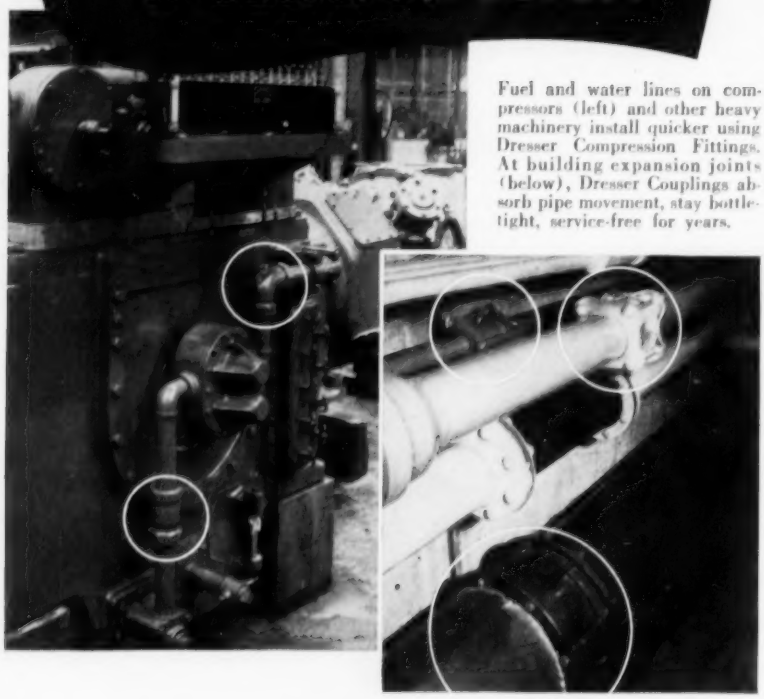
the DRESSER way
is *Easier... Surer!*



Fuel and water lines on compressors (left) and other heavy machinery install quicker using Dresser Compression Fittings. At building expansion joints (below), Dresser Couplings absorb pipe movement, stay bottle-tight, service-free for years.

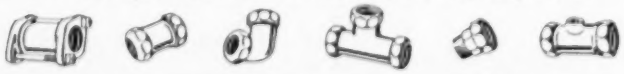
You're sure of providing the quickest, most trouble-free installations . . . at the lowest possible over-all costs . . . when you use Dresser Style 38 Couplings and Style 65 Compression Fittings!

They eliminate threading, exact pipe fitting, grooving, soldering, flaring and caulking. With Style 65s, for instance, you simply stab plain pipe ends into a factory-assembled unit and tighten the end nuts. Style 38s assure permanent, bottle-tight joints for plain-end steel, cast iron or other pipe . . . wrench-installed in but two man-minutes per bolt.

Style 65 Fittings are available in sizes from 3/8" to 2". Style 38 Couplings to 12" OD and over.

SEE YOUR LOCAL PIPING SUPPLIER TODAY

for the complete Dresser line of couplings, ells, tees, adapters, etc.



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Dresser Manufacturing Division, 79 Fisher Ave., Bradford, Pa.

RECENT TRADE LITERATURE

Continued

▸ *PIPE, FITTINGS*—New 8 page catalog No. 307 describes uses, advantages, recommended installation practices for company's line of pipe and fittings. *Orangeburg Mfg. Co., Dept. HPAC, Orangeburg, N.Y.*

▸ *SOLVENT, AIR RECOVERY*—Technical bulletin W-356 is general survey of solvent and air recovery by means of activated charcoal. Covers theory, history. Details advantages. *Barnebey-Cheney Co., Dept. HPAC, Cassady at Eighth Ave., Columbus, Ohio.*

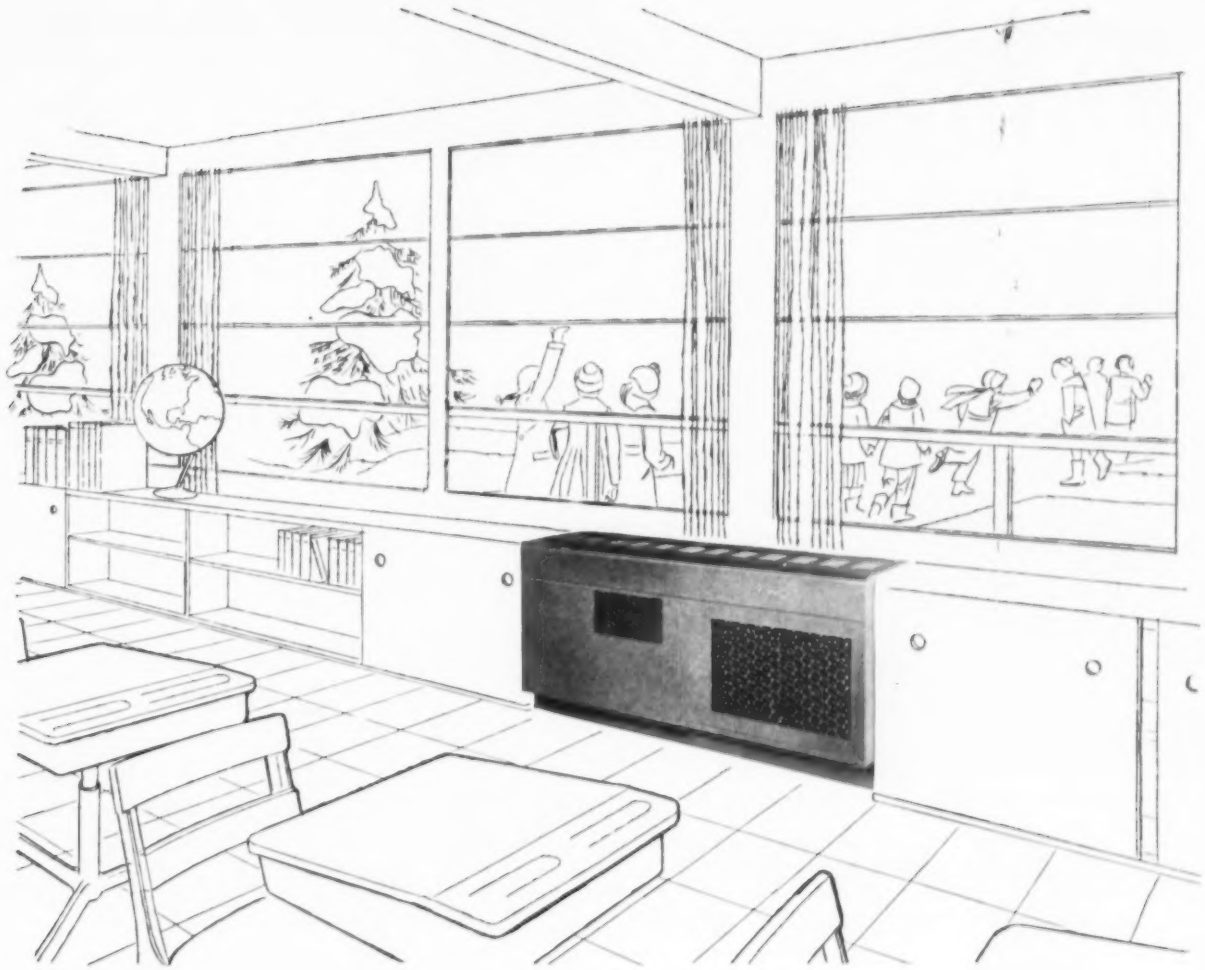
▸ *CEILING MOUNTED RADIATORS*—New 4 page bulletin details ceiling mounted "AIRadiators." Includes information on sizes and heat outputs, illustrations and descriptions of design and construction features. *Shaw-Perkins Mfg. Co., 201 E. Carson St., Pittsburgh 19.*

▸ *FITTINGS*—Basic information on forged steel screw-end and socket-welding fittings, 150 lb stainless fittings, unions and special fittings, hydraulic pumps and jacks contained in 12 page catalog. *W-S Fittings Div., H. K. Porter Co., Inc., Dept. HPAC, P.O. Box 95, Roselle, N. J.*

▸ *INDUSTRIAL WASTE TREATMENT*—Technical paper No. 64 presents practical systems for process and waste water treatment utilizing controlled volume pumps to meter chemicals and additives. *Milton Roy Co., Dept. HPAC, 1300 E. Mermaid Ln., Philadelphia 18.*

▸ *AIR CONTROL VALVES*—Reference guide covers 17 different lines of air control valves, accessories. *Airmatic Valve, Inc., Dept. HPAC, 7317 Associate Ave., Cleveland 9.*

▸ *VIBRATION CONTROL*—"Isolant" line of vibration control material described, illustrated in catalog No. IS-55. *T. R. Finn & Co., Inc., Dept. HPAC, 200 Central Ave., Hawthorne, N.J.*



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The new Norman Schoolroom Heater provides all the advantages of a central heating system **at low cost.** It is a big part of the answer to keeping **school construction costs down.**

It's compact and easy to install — can be recessed — or built in with bookshelves under a window. Cuts installation cost! No costly ductwork or additional ventilating systems needed.

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Heating System Expansion Control Guide

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When your installation problem is piping expansion control, Flexonics Corporation provides a complete package of answers. Flexonics Corporation manufactures low pressure expansion compensators for horizontal runs in baseboard heating lines . . . high pressure compensators for steam and hot water risers and horizontal runs . . . and FLEXON® Expansion Joints in a wide range of types and sizes for power and process piping.

Every unit in the FLEXON® "Complete Package" has been specially engineered to eliminate the danger of uncontrolled expansion, the objectionable noise of pipe creeping and to give you long maintenance-free service. Easily installed, they are space savers that require no access panels because they require no packing—for the life of the piping system. Install "Flexon" with confidence.

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FORMERLY CHICAGO METAL HOSE CORPORATION
Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

RECENT TRADE LITERATURE

Continued

▸ *BLOWOFF VALVE*—Literature illustrates, describes blowoff valve with seatless design. *Yarnall-Waring Co., Dept. HPAC, Mermaid Ln., Philadelphia* 18.

▸ *REFRIGERATION EQUIPMENT*—Bulletin DS-399 gives data on company's "CenTraVac" centrifugal refrigeration equipment designed to provide chilled water for air conditioning and refrigeration systems. *Trane Co., Dept. HPAC, La Crosse, Wis.*

▸ *PUMPS*—Bulletins 1020 and 1030 illustrate, detail features of company's double ended "canned" motor pumps and sealless centrifugal pumps, respectively. *Chempump Corp., Dept. HPAC,* 1300 *E. Mermaid Ln., Philadelphia.*

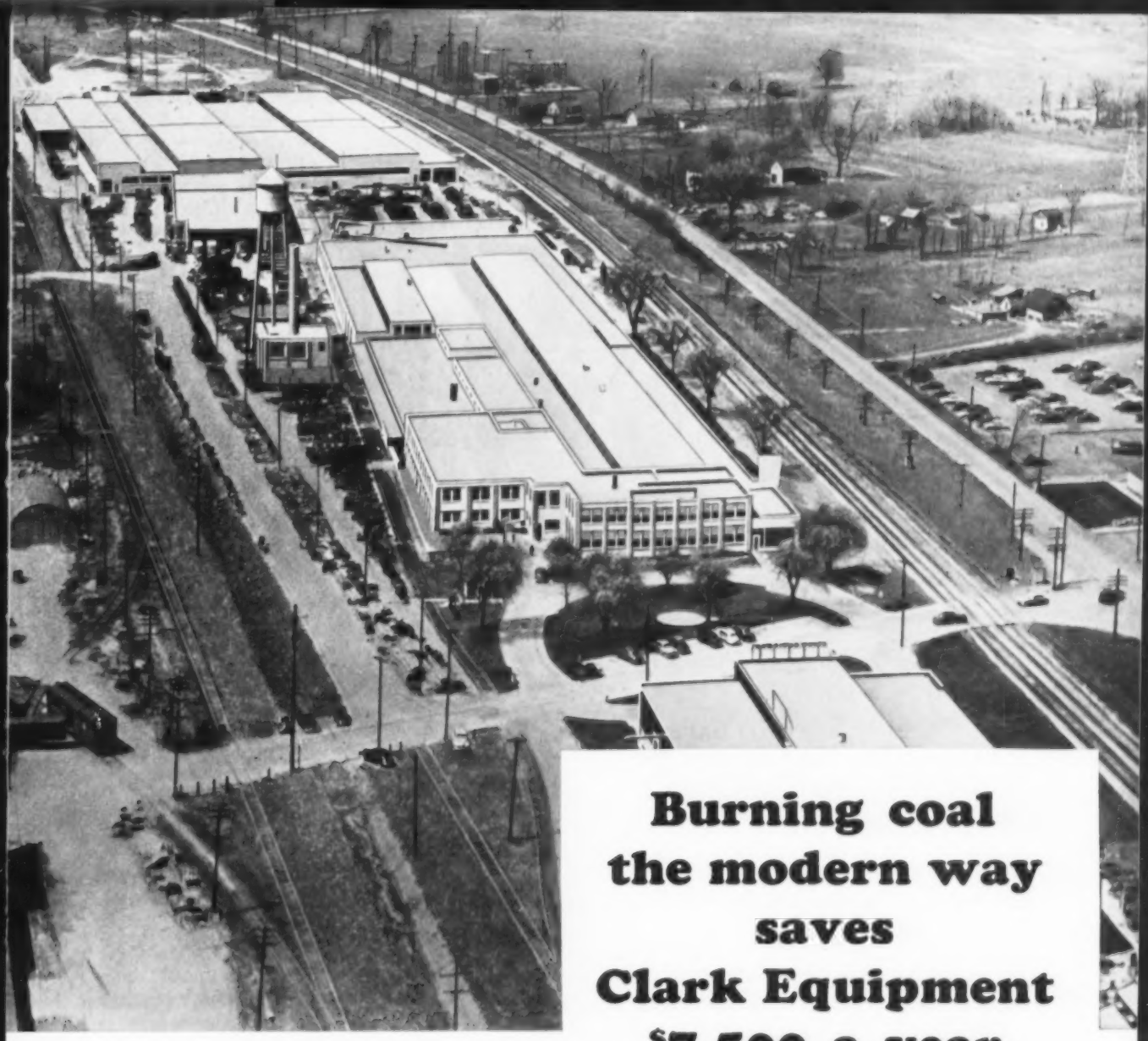
▸ *BLOWERS*—New 20 page brochure contains technical specifications for line of unplasticized rigid polyvinyl chloride blowers. Performance tables included. *Industrial Plastic Fabricators, Inc., Dept. HPAC, Norwood, Mass.*

▸ *HUMIDITY CONTROL*—Reprint tells how company's humidity conditioning equipment is doing a wide range of useful jobs in a New England candy plant. *Kathabar Div., Surface Combustion Corp., Dept. HPAC, Toledo.*

▸ *OIL CONTROLS*—Constant level oil controls, bottle oilers for plain bearing lubrication, glass body oil cups, aluminum body oil cups described in 4 page circular. *Lunkenheimer Co., Dept. HPAC, P.O. Box 360, Cincinnati* 14.

▸ *HEATING, AIR CONDITIONING—Making the Weather Behave* is booklet containing specifications, dimensions of company's heating, air conditioning equipment. *Mueller Climatrol, Dept. HPAC,* 2005 *W. Oklahoma Ave., Milwaukee* 15.

▸ *COOLING CONTROLS*—New 24 page catalog contains specifications,



Burning coal the modern way saves Clark Equipment $7,500 a year

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

Expanding production facilities at Clark Equipment Co., Battle Creek, Mich., created a need for more steam within the plant. In the face of rising overall costs, Clark engineers decided to meet this demand by modernizing the firm's power system.

Today, two watertube boilers utilizing spreader stokers have replaced three firetube boilers, underfeed fired. Stokers are fed by screw conveyor and controls are fully automatic. As a result of these and other aspects of its modernization program, Clark's boiler plant has now increased plant efficiency, supplying reliable, low-cost steam for all purposes—at a savings of $7,500 a year.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

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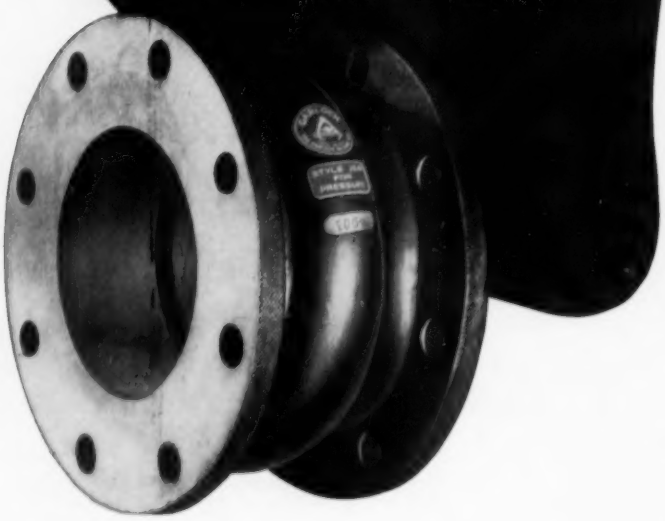

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prevent transmission of sound and absorb vibration in water, air, or exhaust steam lines . . . save wear and tear on pipe flanges. Garlock Expansion Joints are made for all pipe sizes from ¾" to 72" and for all service conditions. They are another important part of the Garlock 2000 . . . two thousand different styles of packings, gaskets, and seals for every need. The *only* complete line available. That's why you get unbiased recommendations from your Garlock representative. Call him, or write for Rubber Expansion Joint Folder AD-137.

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For Prompt Service, contact one of the 30 sales offices and warehouses throughout the U.S. and Canada.

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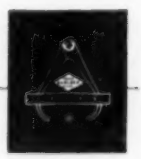


RECENT TRADE LITERATURE

Continued

operating data on company's line of mechanical cooling controls. *Penn Controls, Inc., Dept. HPAC, Goshen, Ind.*

▸ *ALUMINUM FOR HEAT EXCHANGERS*—New 16 page brochure emphasizes properties of aluminum in fabrication of heat exchangers. Charts, specification tables included. *Reynolds Metals Co., Dept. HPAC, 2500 S. Third St., Louisville.*

▸ *PLASTIC PIPE*—Information on "Ryertex-Omicron" polyvinyl chloride rigid type unplasticized pipe given in technical bulletin 80-3. Literature lists over 200 chemicals it will convey without being attacked, says company. *Joseph T. Ryerson & Son, Inc., Dept. HPAC, P.O. Box 8000-A, Chicago* 80.

▸ *CONDENSATION RETURN UNITS*—Bulletin H-113 describes company's line of galvanized steel and cast iron receiver condensation return units. Selection tables, typical dimensions for both types included. *Aurora Pump Div. of New York Air Brake Co., Dept. HPAC, Aurora, Ill.*

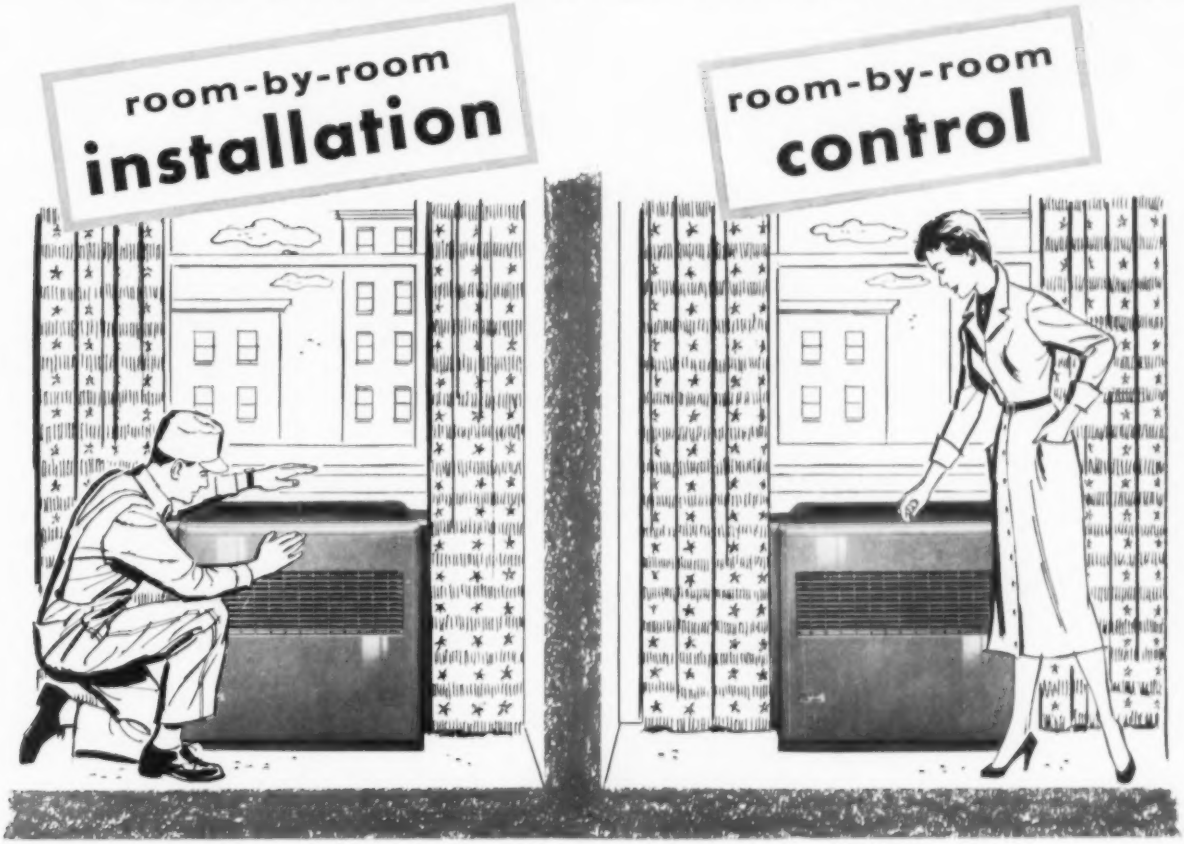
▸ *BALL BEARINGS FOR BLOWERS, FANS*—Bulletin contains drawings, specification tables for company's ball bearing line as applied to equipment of various blower and fan manufacturers. *Fafnir Bearing Co., Dept. HPAC, New Britain, Conn.*

▸ *RADIATION*—Catalog No. 102 describes "Sill-Line" radiation. Booklet gives details of five enclosure styles and range of sizes offered. *John J. Nesbitt, Inc., Dept. HPAC, Philadelphia* 36.

▸ *CONDENSATE, VACUUM PUMPS*—Company's new type "S" condensate pump, complete line of vacuum and condensate pumps described in 28 page bulletin No. 1465. *Sarco Co., Inc., Dept. HPAC, Empire State Bldg., New York* 1.

NOW —

a recessed year-round air conditioner that allows...



ONLY Mueller Climatrol gives you both for commercial and institutional buildings

HERE'S the unit that lowers all barriers to discarding half-year comfort in favor of year-round, controlled air conditioning. New recessed air conditioners by Mueller Climatrol can be installed on a budgeted program, utilizing existing central steam or hot water facilities. For cooling, each unit is equipped with its own refrigeration cycle.

Practical cost, too — only about half as much to install as central cooling *alone!* And there's also a 20% operating saving, as compared with a complete central system.

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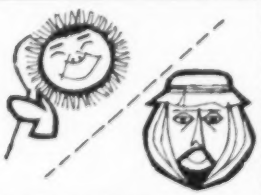
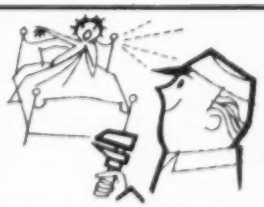


TO EACH HIS ZONE. Heating and cooling are controlled individually in each room by built-in thermostats.



TENANTS AREN'T DISTURBED. You can set up a system for installation in unoccupied rooms on a rotative basis.

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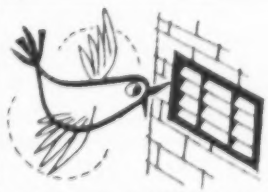

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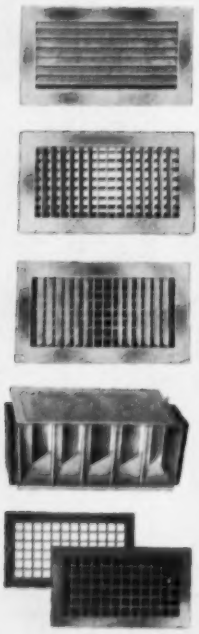

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RECENT TRADE LITERATURE

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▸ *AIR HANDLING UNITS*—New 40 page engineering manual No. E.M.-G. 5622 contains data on company's ceiling suspended and floor mounted air handling units for commercial, industrial, residential heating and cooling. *Drayer-Hanson, Inc., Dept. HPAC,* 3301 *Medford St., Los Angeles.*

▸ *GEARMOTORS*—*Reduce Speed* is title of 8 page bulletin E-2408 which describes company's line of gearmotors. *Reliance Electric and Engineering Co., Dept. HPAC,* 1076 *Ivanhoe Rd., Cleveland* 10.

▸ *PUMPS*—Turbine type pumps illustrated, discussed in 8 page bulletin No. 111. Assembled, exploded views show features. *Aurora Pump Div. of New York Air Brake Co., Dept. HPAC, Aurora, Ill.*

▸ *RADIATORS*—*Solving modern room heat distribution problems* is 16 page bulletin containing descriptions, illustrations of proper radiator installation for churches, hospitals, schools, offices, etc. *Shaw-Perkins Mfg. Co., Dept. HPAC,* 201 *E. Carson St., Pittsburgh* 19.

▸ *REFRIGERATING MACHINE*—New 8 page bulletin 1426 covers design features of "Tonrac" single stage hermetic centrifugal refrigerating machine. *American Blower Co., Dept. HPAC, Detroit* 32.

▸ *HOT WATER HEATING*—New literature is design survey of hot water heating problems as encountered in secondary schools for both shower and dishwater loads. *Fred H. Schaub Engineering Co., Dept. HPAC,* 2110 *S. Marshall Blvd., Chicago* 23.

▸ *MULTIPLE V-BELT DRIVES*—Origin, history, development of modern multiple V-belt drive discussed in 36 page booklet 20E8297. Evolution of standards in engineering drives covered. *Allis-Chalmers Mfg. Co., Dept. HPAC, Milwaukee* 1.

New *SKIL* Shear Sweeps Field in Actual Comparison Tests!

SKIL Model 231 Wins 5 Trials Out of 5 Outperforms, Outproduces All Others

Actual tests prove what many sheet metal men are learning for themselves. The new SKIL 231 Shear is far superior to all others on the market. These tests show the speed, power, and control that are making the SKIL Shear so popular on every job . . . in every shop.

Here are actual results of impartial tests of the SKIL Model 231 Shear and competitive brands. Shown are performance figures for SKIL, Brand A, and Brand B.

Test 1:

25" Trial Cut of 12 Gauge Metal

Model 231	9.2 seconds
Brand A	15.3 seconds
Brand B	12.0 seconds

Test 2:

Cutting Right and Left Hand Circles

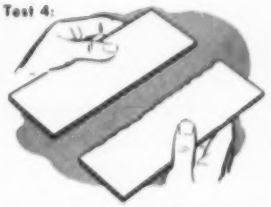
Model 231	22.0 seconds
Brand A	24.0 seconds
Brand B	22.2 seconds

Test 3:

Small Diameter of Circular Cuts

Model 231	1½"
Brand A	2"
Brand B	(right hand) 2½" (left hand) 4½"

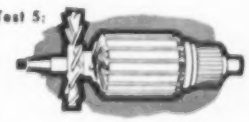
Test 4:



Cleanness of Cuts

Model 231	Excellent
Brand A	Good
Brand B	Poor

Test 5:



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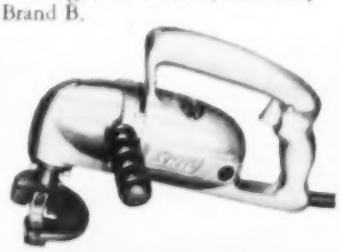
SKIL 40% more powerful than Brand A and 33⅓% more powerful than Brand B.

SKIL SHEAR 231—Best All-Around

The results show that the 231 is the best all-around Shear on the market today. Faster, easier handling, more powerful! Features like the Contour Grip Handle at the rear of the tool make it a favorite with workmen who have tough cutting to do. Improved foot design keeps maintenance costs down for job superintendents. This is the shear you need in *your* shop. The SKIL Model 231.



FREE! Mail the Coupon for a Demonstration and a FREE Trial of the SKIL SHEAR Model 231! See How Much Faster, Easier-Handling this New SKIL Shear is on your Toughest Cutting Job!

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For Lower-Cost Installation and Longer Service Life

The problems of vibration, undesirable sound resulting from it, or expansion and contraction, are met with reliable efficiency and economy in GOODALL Rubber EXPANSION JOINTS . . . products of long experience and uncompromising craftsmanship.

WIDE SELECTION . . . Three Types — "Flang-Lok", Right Angle and Sleeve. Five styles — Single Arch, Multiple Arch, Tapered, Offset and Rectangular. All sizes — From ⅜" I. D. to 96" I. D. For pressure, vacuum or both.

EASIER TO INSTALL . . . on new construction or as replacements for other types. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. "Flang-Lok" Joints are especially easy to install, and provide a nonmetallic seal.

RESPONSIVE TO MINIMUM PRESSURE . . . Only slightest pressure is required to create movement in the rubber joint, in any direction. Result — stress on metal pipe or other member is reduced to absolute minimum.

HIGHER WORKING PRESSURES . . . Goodall Rubber Expansion Joints operate efficiently at working pressures to 125 lbs. P. S. I., depending on size.

LONGER SERVICE LIFE . . . No embrittlement . . . continuous movement (Flexing) actually keeps the rubber joint "alive." No corrosion. No electrolysis. Highest resistance to abrasion.

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GOODALL Rubber Company

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Branches and Distributors Throughout the United States and in Canada

RECENT TRADE LITERATURE

Continued

▸ *MOTOR CONTROL CENTER*—General purpose motor control center designed to permit saving of up to 50 percent in floor area described in 24 page bulletin GEA-6367. *General Electric Co., Dept. HPAC, Plainville, Conn.*

▸ *CERAMIC BACKING RINGS*—Literature discusses case history of fabrication and welding of stainless steel piping with "Pyrotone" ceramic backup. *General Ceramics Corp., Dept. HPAC, Keasbey, N.J.*

▸ *AIR CONDITIONING EQUIPMENT*—Submittal data sheets detail floor mounted and ceiling suspended air conditioning equipment. Photographs, specifications, dimensional data charts for all models included. *Drayer-Hanson, Inc., Dept. HPAC, 3301 Medford St., Los Angeles.*

▸ *CONTROL OF DIRECT RADIATION*—Bulletin CA-12 tells how to determine proper control system for direct radiation. Includes control of steam, hot water. Discusses two-position and proportioning modes of control. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▸ *HEATING CONTROLS*—New items including line of oil, coal, electric heating controls, plus changes in line of gas heating controls included in company's catalog. *General Controls Co., Dept. HPAC, Skokie, Ill.*

▸ *AIR CURTAIN*—New 4 page folder describes, lists features, shows typical installation photographs of air curtain systems. *American Air Curtain Corp., Dept. HPAC, 10408 Manchester, St. Louis 22.*

▸ *RADIANT HEATING*—Developments in company's radiant ceiling designed to heat, cool and have sound control contained in bulletin No. A-138. Three-way functional ceiling described. *Architectural Products Div. Burgess-Manning Co., Dept. HPAC, 5970 Northwest Hgwy., Chicago.*

Cancer and healthy cells seem to feed on different kinds of "food." We know how to make some cancer cells die by starving them. Will we starve out all kinds of cancer cells one day? Only more work and research will tell.

Some cancer patients develop substances that fight their own tumors. When science knows more about antibodies, we may have a new cancer treatment. Only more work and research will tell.

Some cancers are being halted by atomic materials. Can new radioactive isotopes affect other cancers in the same way? Only more work and research will tell.

New drugs are being developed that fight specific kinds of cancer. Will any of them turn out to be cancer-killers? Only more work and research will tell.

Some good news about cancer

. . . and how you can make the news better

These photographs illustrate some of the work our scientists are doing in the fight against cancer. Just one thing is needed to keep this research going. Your help. If you—and all of us—give today, the research will go on until we conquer our greatest enemy—cancer. Help fight cancer with your check. Give generously. Send your contribution to CANCER, c/o your town's Postmaster. AMERICAN CANCER SOCIETY.

heat-x

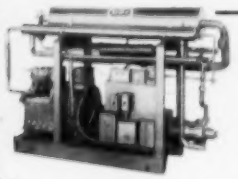
a Package Chiller FOR EVERY APPLICATION

Famed INNER-FIN Construction
All NON-FERROUS Water Passages

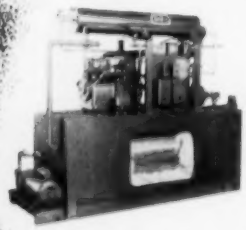
There's a Heat-X package chiller to meet your every requirement . . . residential, commercial, institutional or industrial. All feature space saving, extra efficiency Inner-Fin construction — *exclusive with Heat-X*. All have completely non-ferrous water passages to guard against corrosion.

In any designated capacity, Heat-X package chillers are *the most compact units made*.

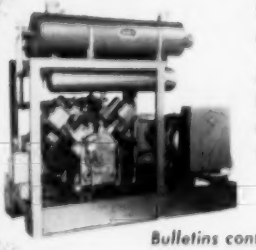
Request free bulletins describing the Heat-X chillers designed to meet *your* particular needs. And for capable engineering assistance on any package chiller problem, contact the experienced Heat-X sales engineer in your area.



'PC' Package Chiller
For broad range of air conditioning, refrigeration and industrial liquid chilling applications. Models from 2 to 75 H.P.



'PCS' Chiller with Storage Tank
For cafeterias, hospitals, schools, theaters, etc. — wherever peak load conditions occur. Stainless steel storage tank with Fiberglas insulation. Range: 2 - 10 H.P. Storage capacity: 40-150 gal.



'RPC' Residential Package Chiller
For domestic applications. Available in 2, 3 and 5 H.P. models. Hermetic Compressors. 230/1/60.

'APC' Chiller
Air cooled units available in 2, 3 and 5 H.P. models. For residential and other applications where air cooled condensing is necessary.

Bulletins containing specifications FREE on request

HEAT-X, Inc.
BREWSTER • NEW YORK

West Coast Factory • Riverside, California

RECENT TRADE LITERATURE

Continued

▸ *FUEL ECONOMY*—Dialogue between school superintendent and custodian explaining cost savings in operation of school heating plant is subject of brochure 541. *Illinois Engineering Co., Div. of American Air Filter Co., Dept. HPAC, 2035 S. Racine, Chicago 8.*

▸ *WEAR BACK FITTINGS*—Data sheet We describes company's line of one piece wear back fittings designed to be abrasion resistant. Fittings engineered for hydraulic materials handling systems, also for pneumatic handling. *Allen-Sherman Hoff Co., Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

▸ *BRAZING ALUMINUM*—Shop data, late developments in brazing aluminum presented in 134 page book. Discussed are history of brazing, brazing processes. *Aluminum Co. of America, Dept. HPAC, 774 Alcoa Bldg., Pittsburgh 19.*

▸ *HIGH TEMPERATURE PRESSURE GAGE*—Instrument designed for giving continuous, accurate readings of pressure under long exposure to high temperatures, radiation covered in 4 page bulletin PG-2. *Callery Chemical Co., Dept. HPAC, Callery, Pa.*

▸ *ARC WELDING*—Technical data card 155A summarizes recommendations for joining, by arc welding procedures, various tubing steels. Indicates proper electrodes to use. Provides information about preheating, postwelding heat treatments. *Babcock & Wilcox Co., Dept. HPAC, Beaver Falls, Pa.*

▸ *FITTINGS, VALVES*—New 28 page catalog covers "Copperflow" line of fittings, valves for copper tube heating, air conditioning, refrigeration. *Keystone Brass Works, Dept. HPAC, Erie, Pa.* ⋕

HEAT-SOURCE VENTILATION

PLUS values in power

in HOWELL series one hundred motors gives you

GREATER MOTOR DEPENDABILITY

EXTRA INSURANCE AGAINST OVERHEATING

A faster, more efficient way to remove internal heat is a clear plus value for the man who buys motors. The cooler they run, the longer they last — and the more leeway there is to take intermittent overloading or excessively high air temperatures.

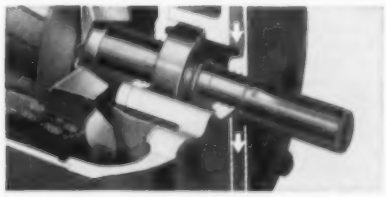
The laminations of Howell's new Series 100 Motors have unique, wide slots in their perimeters that carry the flow of fan-driven air right to the source of motor heat. There's 50% more contact between cooling air and the stator laminations than in conventional cores with smooth outer diameters.

Compare any or all of the new rerated motors with the Howell Series 100. Only then will you have facts to make the best buy!

GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors

heat dissipating copper-clad rotors

Copper's faster heat conductivity (91% greater than aluminum's) reduces heat build-up in Series 100 motors. Copper rotors meet your special design requirements better, too.



Howellube greasing system checks over-lubricating

Grease enters and exits on same side of bearings — is never forced through to pack them tight. Results: longer bearing and motor life.

smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins, when a sleek, good looking motor costs no more.

For more details on Series 100 motors, write for Bulletin N-100-R

HOWELL Red Band MOTORS

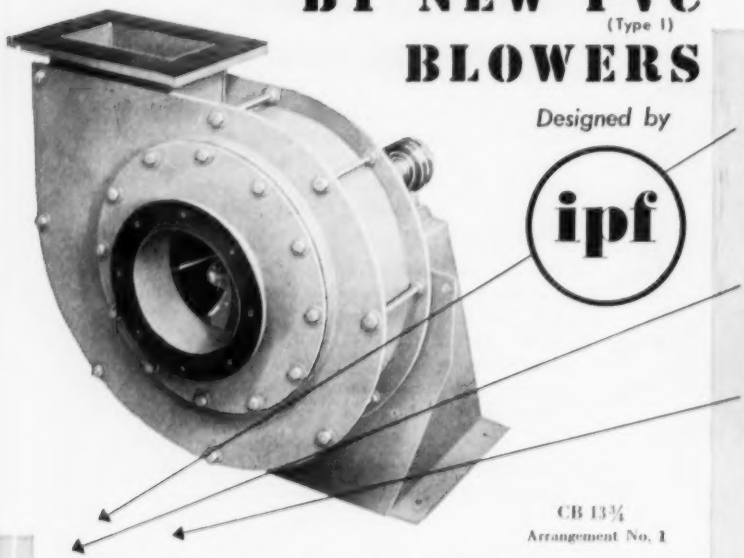
HOWELL MOTORS

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

OUTMODED BY NEW PVC (Type 1) BLOWERS

Designed by ipf



CB 13¾
Arrangement No. 1

If your problem is expelling corrosive fumes and gases, you need IPF Blowers. Ordinary blowers are susceptible to attack by these fumes and gases. Coating the blower is costly — and not foolproof. Maintenance and replacement costs are high . . . and valuable time is lost. Result — an expelling operation that eats into profits.

For trouble-free, long-life blowers, specify **IPF** blowers made of Unplasticized, Rigid Polyvinyl Chloride (UPPVC). UPPVC — the new construction material — exhibits inherent anti-corrosive qualities that allows **IPF** Blowers to withstand most chemical fumes and gases from 40°F to 140°F. Actual installations of **IPF** Blowers have lasted three times the normal life of ordinary blowers . . . and continue to function efficiently.

UPPVC is a lightweight . . . smooth surfaced . . . nonporous material of construction. Lightweight construction means greater capacity per B.H.P. . . . easier installation . . . reduced handling problems. Smooth, nonporous finish never require painting or maintenance expense. **IPF** Blowers are not subject to unbalance from chipping of a protective coating . . . because there is no coating. It's solid UPPVC.

IPF Blowers made of UPPVC are available in standard sizes that provide displacements from 143 C.F.M. to 7722 C.F.M. Standard wheel sizes of 9½, 13¾, 19, and 27 inches. Other sizes and capacities can be custom designed to fit special requirements. Full details on the new **IPF** Blowers available upon request.

Full details on the new IPF Blowers available on request.

MANUFACTURED BY
industrial plastic fabricators, inc.
NORWOOD, MASS. NOrwood 7-3411

WHO'S WHAT . . .

(New personnel, promotions)

▸ *RHEEM MFG. CO.*—Donald L. Rheem, chairman of the board; A. L. Walker, executive vice president; Emerson S. Ronk, vice president of administration. Both Mr. Walker and Mr. Ronk will serve on Rheem's executive committee.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—Elbert M. Palmer, president, Kewanee Boiler Div., succeeding Wm. Bradford Russell, retiring. Mr. Russell will continue to assist in a consultive capacity.

▸ *YORK-SHIPLEY, INC.*—W. Douglas Read, assistant to the president.

▸ *EMERSON RADIO AND PHONOGRAPH CORP.*—Stanley M. Abrams, and Frank Rogers, president and manager of the hotel and motel department, respectively, of the new subsidiary, Emerson Industrial Products Corp., formed to promote the rental and sales of air conditioners and other products to hotels, motels and similar commercial establishments.

▸ *WESTINGHOUSE ELECTRIC CORP.*—Richard D. Hartsig, manager of contract sales, air conditioning division.

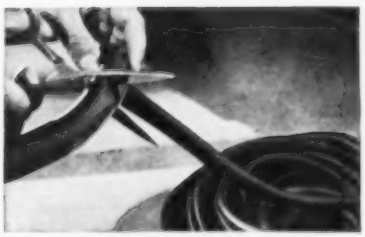
▸ *DEPARTMENT OF AIR POLLUTION CONTROL*—Sylvan L. Hanauer, deputy commissioner.

▸ *JOHNSON SERVICE CO.*—John H. Colby, general sales manager.

▸ *STANDARD PRESSED STEEL CO.*—John W. Breitmayer, sales manager, Hallowell Collar Div.

B.F.Goodrich

How Cell-Tite® solves 2 miles of condensation problems



Supplied in 50 foot rolls, tubing can be custom cut for the job, eliminating waste and reducing costs.

Flexible Cell-Tite tubing is ideal for short, sharp curves of copper tubing. Except for modernizing existing installations, piecing or gluing is unnecessary.

AFTER a recent air conditioning installation that required over 11,000 feet of Spongex Cell-Tite tubing, Mr. Charles Ross, President, Economy Plumbing & Heating Co., Chicago, said:

"Spongex Molded Cell-Tite is in a class by itself as an insulation material on flexible copper tubing. It certainly has solved a long-standing problem. We'd tried everything in the past; some were too slow and sloppy, others too bulky and rigid, and still others were supplied only in 3-foot lengths.

"With Cell-Tite, cutting the tubing to length is no problem at all. We simply use ordinary scissors. We don't have any messy gluing problem. Actually, the most inexperienced workmen can slip this material around a coupling, and achieve a tight fit."

Spongex Cell-Tite is durable rubber with millions of non-interconnecting cells, each acting as a separate insulator. This means Cell-Tite tubing not only protects against moisture condensation in the summer, but also withstands the high temperatures of winter heating.

As tubing, Spongex Cell-Tite is made with standard outside diameters of ¾", 1", 1¼", 1½", and can be made 1⅛", 1¾" and 2". Almost any inside diameter is available up to ¼" of the outside diameter in lengths up to fifty feet.

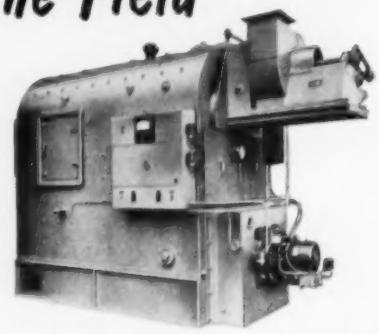
For more technical information write B. F. Goodrich Sponge Products Division, 281 Derby Place, Shelton, Conn.

B.F.Goodrich

SPONGE PRODUCTS DIVISION

281 DERBY PLACE, SHELTON, CONNECTICUT

Compare International Water Tube Boilers *with the Field*



- **Ample Furnace Volume—low heat release rates**
- **Convertible to Coal Firing**
- **Reserve Capacity Always Available**
- **Rapid Directed Water Circulation**
- **Maximum Heat Absorption—quick steaming**
- **Induced Draft—quiet operation**
- **Fully Coordinated—fire tested**
- **Oil, Gas or Combination Firing**

International Water Tube Boilers are available as complete, package units, or as boiler-burner units for on the job installation.

and You Will Specify INTERNATIONAL WATER TUBE HEATING and POWER BOILERS

It will pay you to specify International, the boilers with extra profits built in. We will gladly send these International Bulletins:

No. 600 —Water Tube Package Units
No. 200 & 500—Water Tube Heating Boilers
No. 300 & 400—Water Tube Power Boilers

IBW **1886-1956**

THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

810 Spruce St. East Stroudsburg, Pa.

WHO'S WHAT

Continued

▸ *AMERICAN GILSONITE CO.*—Ernest T. Smith, head, "Gilsulate" service section.

▸ *SERVEL, INC.*—J. Patrick Lannan, a partner in Kneeland & Co., W. F. Rockwell, Jr., president of Rockwell Mfg. Co., and A. Lightfoot Walker, director of Rheem Mfg. Co., are nominated as new Servel directors.

▸ *A. M. BYERS CO.*—J. Frederick Byers, Jr., executive vice president; Albert R. Frame, vice president in charge of operations.

▸ *ROBERTSHAW-FULTON CONTROLS CO.*—George L. Ogdin, Jr., general sales manager, Fulton Sylphon Div.

▸ *DRAYER-HANSON, INC.*—A. J. Mallinckrodt, special products engineer at Los Angeles main plant facility.

▸ *THE BULLARD CO.*—Russell C. Kinsman, superintendent of works engineering.

▸ *ELECTRO-THERM, INC.*—N. J. Berger, general manager; John J. Finn, chief engineer.

▸ *INSTRUMENT SOCIETY OF AMERICA*—Dr. Elmer W. Engstrom, senior executive vice president and a director of Radio Corp. of America has been appointed General Chairman of the 11th Annual International Instrument-Automation Conference and Exhibit. Assisting Dr. Engstrom are: Robert T. Sheen, president, Milton Roy Co.; Wm. H. Kushnick, ISA executive director, and Fred Tabery, ISA exhibit manager.

American General Investment Corp. Main and Richmond Sts., Houston, Texas. *Architect:* Wyatt C. Hedrick, Inc.

WHY DID THIS HOUSTON FIRM SELECT G-E PACKAGED AIR CONDITIONERS?

Six G-E units cool 20,000 sq. ft. . . . satisfy the individual cooling needs of five zones

Progressive firms like American General Investment Corporation are turning, more and more, to the modern, low-cost way to air condition a building. G-E Packaged Units have all the efficiency of central systems *plus* greater flexibility in meeting varied air conditioning requirements.

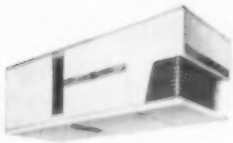
In American General Investment's new Houston office, the large office areas, the numerous small offices and the business machine room are divided into five zones. Six G-E units—one 5-ton, one 15-ton and four 10-ton, all located out-of-space—permit individual temperature and humidity control of each zone.

Thus, both the business machine room, which has a high internal heat load, and the normally less warm offices, are independently air conditioned—eliminating the problem of overcooling one zone in order to keep another zone comfortable.

Furthermore, since a G-E Packaged System is a *unit* system, just those zones are cooled in which people are working. Any unit may be taken out of operation at any time. And if a unit requires servicing, such as a periodic change of filter, it may be shut down without affecting the operation of other units. Write for data to: General Electric Co., Commercial and Industrial Air Conditioning Dept., Bloomfield, N. J.

MORE ADVANTAGES WITH G-E PACKAGED AIR CONDITIONERS:

- Low installation, low operating costs.
- Provide maximum design freedom in new construction and modernization. Floor models can be used in space or concealed. Ceiling-mounted models take no floor space—may be shelf-mounted.
- Streamlined cabinet styling.
- All models may be used singly or in multiple to meet any air conditioning need.
- Muggy Weather Control removes excess moisture in any weather without overchilling or clammy cooling.
- Built and assembled by G.E. Five-year warranty covers entire sealed cooling system.



Self-contained ceiling models—3 and 5 ton air-cooled—3, 5 and 7½ ton water-cooled.

Self-contained floor models—3, 5, 7½, 10 and 15 ton water-cooled.

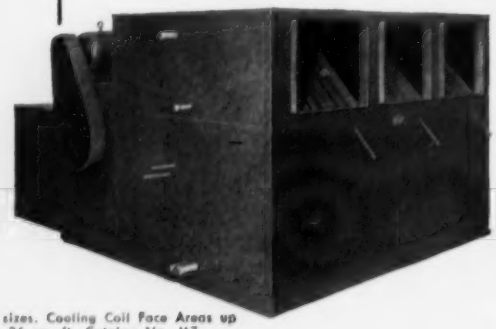
packaged AIR CONDITIONERS

Progress Is Our Most Important Product

GENERAL ELECTRIC

CONSISTENTLY RELIABLE

KENNARD *Engineered* AIR CONDITIONING EQUIPMENT

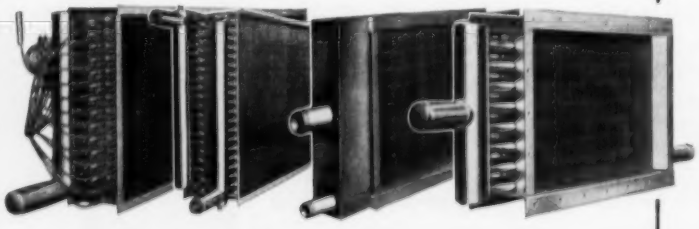


MULTI ZONE UNITS

6 sizes. Cooling Coil Face Areas up to 36 sq. ft. Catalog No. MZ.

AIR CONDITIONING BLOWER UNITS

13 sizes. 300 to 21,600 CFM. Horizontal or Vertical. Catalog No. AC.



AIR CONDITIONING AND HEATING COILS

Direct Expansion, Water, Steam Distributing Tube, Standard Steam Coils. Sizes up to 48" wide x 132" long. Catalogs No. CC and HC.

Write for name of nearest representative and catalogs needed.

KENNARD CORP.
1817 S. HANLEY ROAD
ST. LOUIS 17, MO.

WHO'S WHAT

Continued

▸ *MORRISON PRODUCTS INC.*—Hunter Morrison, chairman of the board; Thompson Morrison, president; Hunter Morrison, Jr., executive vice president; Al Galaba, vice president, engineering; R. W. Lowe, treasurer and assistant secretary; Spencer Colett, secretary.

▸ *JOSEPH T. RYERSON & SON, INC.*—George Locotos, manager of the work order department, Boston steel service plant.

▸ *E. H. TITCHENER & CO.*—Charles S. Bishara, assistant to the sales manager specializing in sales promotion and advertising activities.

▸ *WALTER KIDDE NUCLEAR LABORATORIES INC.*—W. E. Kelley, president.

▸ *ECONO PRODUCTS CO.*—John F. Glump, vice president in charge of sales and advertising and member of board of directors.

▸ *N. O. NELSON CO.*—Keith Munroe, president; George W. Hoffman, vice president in charge of administration; W. M. McKinney, vice president in charge of sales; E. N. Noel, treasurer; R. L. Pabst, comptroller; Fred F. Jones, general sales manager.

▸ *TRANE CO.*—Harry Case, manager, jobber sales department; James M. Whalen, Trane's manager of convector sales, elected president of the Convector Manufacturers' Association, Inc.

▸ *WALWORTH CO.*—M. Mark Watkins, director. Mr. Watkins is executive vice president and a director of Conoflow Corp.

WHAT 22 YEARS' EXPERIENCE TELLS ME ABOUT THE FUTURE OF REFRIGERATION

By Tully A. Gross

"Our business records clearly show trends that help forecast the future of refrigeration," says Mr. Tully A. Gross, president of Harding & Gross, refrigeration engineers and contractors, Cambridge, Mass. "We've been in business 22 years. During that time we've seen Du Pont's 'Freon'* refrigerants supplanting all other types.

"We process from 150 to 200 industrial air conditioning and refrigeration contracts a year. Our recent installations range from cyclotron refrigeration and skating rinks to live-lobster storage-tank cooling. In every case 'Freon' has been perfect for the job.

"We rely so much on 'Freon' refrigerants that a dependable source of supply is very important to us. That's why we've been doing business with the A. E. Borden Company for ten years. They give prompt, efficient service on any of our 'Freon' refrigerant needs.

"We don't know of a more versatile group of refrigerants or any that can match the properties of 'Freon'. Our experience shows that 'Freon' refrigerants have become a most vital part of the refrigeration and air conditioning industry today."

You can get Du Pont "Freon" refrigerants at your wholesaler's now for any air conditioning or refrigerating job. Reciprocating, rotary or centrifugal compressors; household, commercial or industrial applications—there's a "Freon" refrigerant ideally suited to your installation. "Freon" is your best refrigerant buy, because it's pure, dry and safe, just as it has been ever since Du Pont started making it 25 years ago. Be sure to ask your wholesaler for Du Pont "Freon" refrigerants.

Want more information or technical data on uses of "Freon"? Write to E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division 74, Wilmington 98, Delaware.

EXPERIENCE HAS NO COMPETITORS

1931 KINETIC 1956

25 years of

FREON

SAFE REFRIGERANTS

*"Freon" is Du Pont's registered trademark for its fluorinated hydrocarbon refrigerants.

DU PONT

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

KENNEDY presents the *NEW* Look in Bronze Gate Valves

Fig. 427
Standard 125-lb. S.W.P. Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Screwed Ends.

Fig. 427BS
Standard 125-lb. S.W.P. Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Brazing Socket Ends.

Fig. 427SJ
Standard 125-lb. S.W.P. Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Solder Joint Ends.

KENNEDY'S *NEW* Cylindrical Design Means Greater Body Strength, Far Longer Leakproof Valve Life!

RUGGED BODY DESIGN . . . assures superior resistance to distortion as proven in high pressure steel valve design; Kennedy's grueling Accelerated-Wear tests conclusively prove this construction guarantees more than 10 times longer leakproof operating life than oval-body valves. Increased weight assures greater durability and longer valve life.

KENALLOY STEM . . . a special Kennedy stem material of silicon bronze with high tensile strength, accurately machined for ease of operation. The bronze alloy prevents seizing or galling and is entirely free from any tendency to dezincify.

PISTOL-GRIP HANDWHEEL . . . non-heating malleable iron, provides firm, easy three-way grip on top, sides and bottom. Indented rim notches top, side and bottom eliminate slip even with greasy gloves.

DISTRIBUTORS!

• *Write today for complete details. Ask for Circular*

THE KENNEDY VALVE MFG. CO. • ELMIRA, N. Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

OFFICE AND WAREHOUSES IN NEW YORK CHICAGO SAN FRANCISCO ATLANTA SALES REPRESENTATIVES IN PRINCIPAL CITIES

WHO'S WHAT

Continued

▸ *HOOKER ELECTROCHEMICAL CO.*—Leslie H. Schnurstein and Lawrence P. Hallahan, production superintendent and plant engineer, respectively, for chlorine-caustic soda plant under construction at North Vancouver, B.C.; J. F. Snyder, Jr., works manager of Kenton, Ohio, Durez Plastics Div.; George A. Gentes and Robert M. Sherwin, works manager and plant engineer of the Tacoma, Wash., plant.

▸ *ROCKWELL MFG. CO.*—Earl Hudson, general manager, new Porterville, Calif. plant.

▸ *KRAMER TRENTON CO.*—Bill Pietkiewicz, assistant chief engineer.

▸ *MINNEAPOLIS - HONEYWELL REGULATOR CO.*—Ralph Allen, administrative assistant to the general sales manager; Clarence W. Spangle, general manager, Honeywell subsidiary in Germany.

▸ *IRON FIREMAN MFG. CO.*—Ralph W. Freeman, production manager of two Cleveland plants.

▸ *CONTROLS CORP. OF AMERICA*—Donald M. Strathearn, Jr., vice president and director of engineering, Soreng Div.; Willis W. Mansfield, vice president and director of manufacturing, also of Soreng Div.

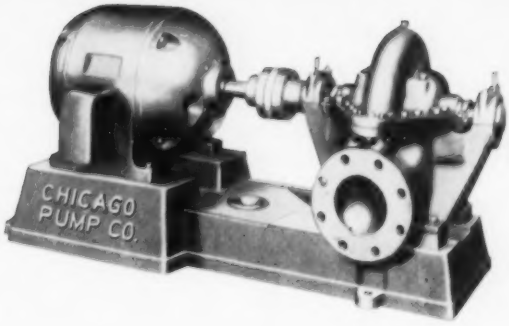
▸ *WACO MFG. CO.*—Charles J. Hoover, vice president and treasurer; Dean B. Chenoweth, vice president in charge of manufacturing; Neil M. Clark, vice president in charge of engineering and research; Arthur F. Allen, chief engineer.

▸ *NATIONAL-U. S. RADIATOR CORP.*—Fred S. Hudson, general manager of sales for heating and air conditioning division.

FROM *Chicago*

TOP QUALITY PUMPS

Engineered for plumbing, heating, and air conditioning systems

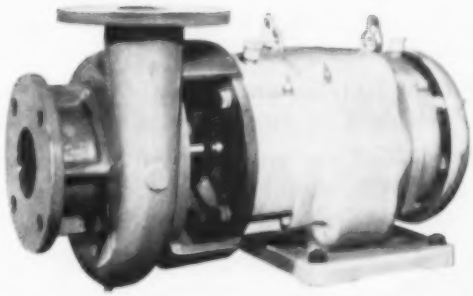


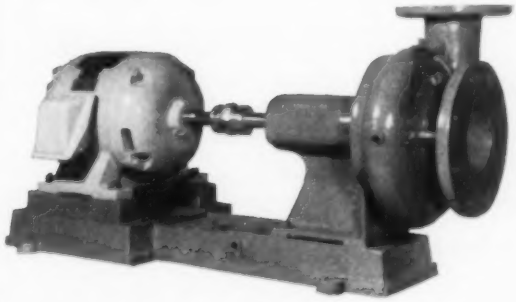
TYPE D DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

A rugged, heavy-duty pump that guarantees long, trouble-free service. The rotating assembly may be inspected without disconnecting the piping. Capacities up to 1900 G.P.M. Heads to 530 Ft. Described in Bulletin 101.

TYPE CC CLOSE COUPLED PUMP

Handles the toughest pumping jobs efficiently and in the least possible space. May be mounted in any position as long as the motor is not lower than the pump. Equipped with leak-proof mechanical seal. Capacities up to 500 G.P.M. Heads to 215 Ft. Described in Bulletin 108.





TYPE FC PEDESTAL MOUNTED FLEXIBLE COUPLED PUMP

Like the CC, all FC pumps are equipped with the most reliable mechanical seal ever built into a pump. Ceramic-faced stationary seat is highly resistant to wear. Accurately lapped surfaces and automatic adjustment for wear assures long life under strenuous service. Described in Bulletin 107.

For trouble-free, "worry-proof," efficient pumping at all times — specify Chicago Pumps. Write for complete information.

fmc

CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DIVISION

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

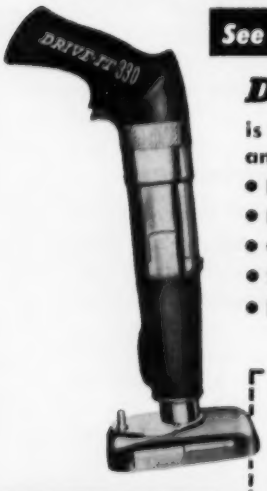
Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems, Flush Kleen ®, Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use.

IF YOU FASTEN *ANYTHING* TO CONCRETE OR STEEL . . .

AUTHORIZED POWDER ACTUATED **DRIVE-IT** TOOLS Power Loads • Drivepins SALES • SERVICE

See Your *DRIVE-IT*® Dealer Who Offers You:

- The fastest method of fastening to concrete or steel with *DRIVE-IT* powder-actuated fastening tools.
- Expert fastening assistance; on the job service. His help ranges from technical reports to tool service and repair.
- The *DRIVE-IT* 330, lightweight, easy-operating stud driver—most advanced powder-actuated tool on the market.
- Over 50 types and sizes of *DRIVE-IT* drivepins—designed for any fastening job.
- *DRIVE-IT* dealers are fastening specialists—see your dealer to learn how you can make money by using *DRIVE-IT* powder-actuated fastening tools.



See Your Dealer For Trade-In Bonus Offer

DRIVE-IT model 330

is used profitably for fastening to concrete and steel by:

- Electrical Contractors
- Heating and Ventilating Contractors
- General Contractors
- Sheet Metal Contractors
- Plant Maintenance Men

SEND COUPON TODAY FOR A DEMONSTRATION

POWDER POWER TOOL CO.
5001 S. E. Johnson Creek Blvd.
Portland 6, Oregon

Please have the *DRIVE-IT* dealer near me give a demonstration of *DRIVE-IT* powder actuated tools.

Name_____

Address_____

City_____ State_____

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WHO'S WHAT *Continued*

▸ *WHIRLPOOL-SEEGER CORP.*—B. F. Donaldson, assistant product manager, refrigeration division.

▸ *SURFACE COMBUSTION CORP.*—Henry M. Heyn, general manager in charge of all functions of the Toledo Industrial Div.; Carroll Cone, chief engineer; Donald Beggs, manager of research and development; G. J. Langenderfer, sales manager of the heat treat division; W. M. Hepburn, C. B. Phillips, E. G. de Coriolis, appointed to staff of the president; A. L. Hollinger, vice president and manager of the steel mill division; Hans W. Bluethe, advertising manager, industrial division.

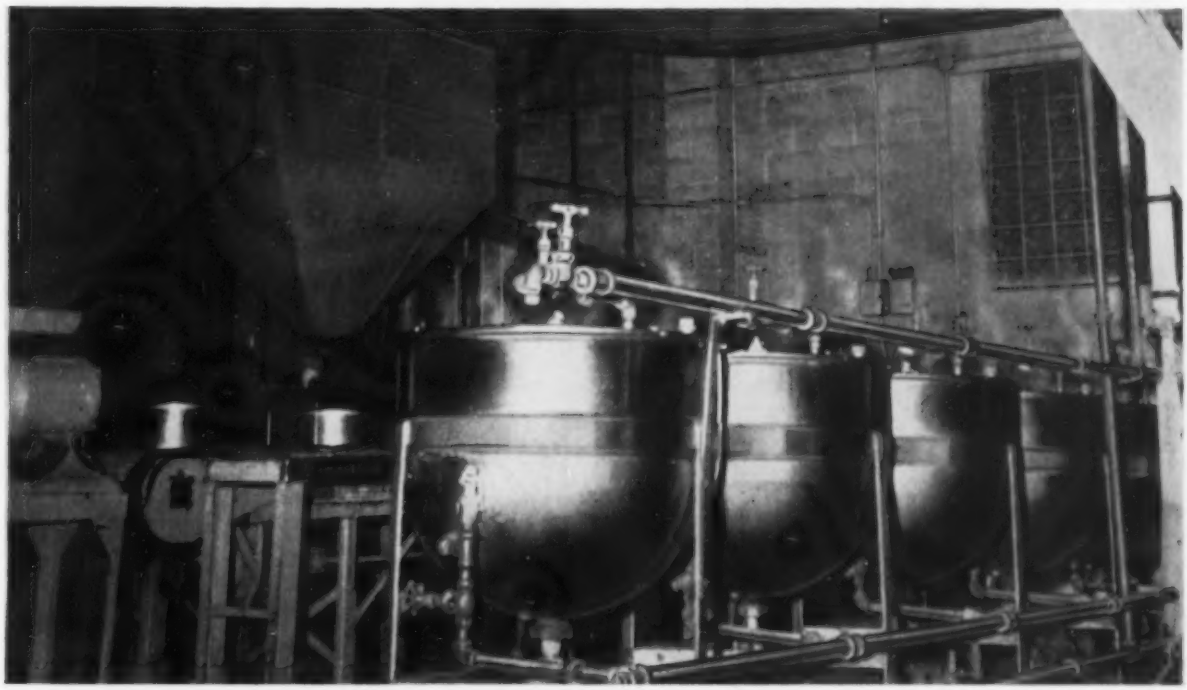
▸ *OLIN MATHIESON CHEMICAL CORP.*—H. F. Devens, manager, Mississippi Aluminum Corp.; U. R. Jaeger, acting sales manager, Olin Roll Bond products, succeeding Mr. Devens.

▸ *BUILDING CONSTRUCTION EMPLOYERS' ASSOCIATION OF CHICAGO, INC.*—Raymond D. Berry, re-elected president; Fred O. Rippel, S. Austin Pope, Royal L. Brockob and Louis L. Narowetz, vice presidents; Arthur H. Wells, treasurer; H. Mayne Stanton, executive secretary.

▸ *ARCO MFG. CO.*—Hugh W. Clarke, treasurer.

▸ *PHILCO CORP.*—James M. Skinner, Jr., to become president after stockholders' meeting in April when the retirement of James H. Carmine takes effect. Mr. Carmine plans to continue as an active member of the company's board of directors and finance committee and serve as special consultant on sales and merchandising.

▸ *HAGAN CORP.*—C. L. Barksdale, vice president, Calgon, Inc., Hagan's chemical subsidiary.



MOISTURE-LADEN AIR was a problem solved by Gallaher Air-Vans®

At BWB Foods, Inc. at Mexico, New York, steam from kettles used to process Grandma Brown's famous country style baked beans presented a serious problem, because the original ventilating system didn't function efficiently enough to exhaust the steam saturated air.

Moisture was condensing onto walls and equipment. Something had to be done.

Two #2208B Direct Drive Air-Vans, rated at 10,000 CFM free air each, were installed by merely cutting holes in the roof and installing the Air-Van roof exhausters over them. No expensive hood or duct-work was necessary. Even with the elimination of expensive duct-work, the Air-Vans keep the plant clear of moisture-laden air.

And from the day of installation the Air-Vans have solved the problem. The management at BWB Foods can be sure of long, trouble-free service, because Air-Van power exhausters have the motor out of the airstream plus a patented air-sealoff to protect the motor against corrosion by the exhausting steam.

This was just one of thousands of jobs solved by Gallaher Air-Vans. It pays to buy Gallaher where *you can be sure* of performance, quiet operation, attractive appearance. Air-Vans with patented scroll design, certified ratings and weatherproof design are unequaled.

CAPACITIES:
150-65,000 CFM.
Static Pressures to 4".

On the BWB Foods, Inc. building, Air-Vans are not visible, not conspicuous.

For full information write

The GALLAHER Company

Omaha, Nebraska **4108 Dodge Street**

Export office 306 Paul Bldg., Utica 2, N.Y. Cable "Keiserquip"

MANUFACTURERS OF POWER ROOF EXHAUSTER BASED ON DESIGN RESEARCH.

R-P&C's complete line of Cast Steel Valves and Fittings

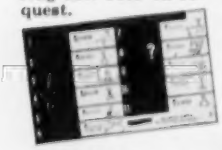
—SIZES UP TO 24"

—PRESSURE CLASSES FROM 150 TO 2500 LBS.

• R-P&C's valve line includes a complete selection of cast steel valves and fittings. These are manufactured in all standard valve steels in a complete range of sizes, pressure classes, and styles.

• Included are gates, globes and angles, swing and lift checks, in a wide range of constructions, and all classes of flanged fittings. Pressure sealed designs for high temperatures and pressures, automatic stop and check valves, and many other special purpose valves and fittings complete the line.

FREE WALL CHART
"How to Protect Your Valves"
17" x 11" wall chart gives installation and operation pointers to protect valves, prolong life. Free on request.



• All R-P&C steel valves and fittings conform to the exacting standards of design and manufacture that users have learned to expect from R-P&C. And all are providing, in many different applications, the dependability that is the R-P&C standard.

See your R-P&C distributor or write for R-P&C's convenient catalog

ACCO

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves

WHO'S WHAT *Continued*

▸ *PLASTIC AND RUBBER PRODUCTS CO.*—Thomas B. Keenan, chairman of O-ring manufacture subdivision of Rubber Manufacture Association, Inc. Mr. Keenan is executive vice president of Plastic and Rubber Products Co.

▸ *CARRIER CORP.*—Cloud Wampler, chairman of the board; William Bynum, president. Mr. Wampler will continue as the company's chief executive officer. Mr. Bynum, executive vice president since 1951, will be in charge of operations.

▸ *COPELAND REFRIGERATION CORP.*—W. G. von Meyer and Rudy Berg, vice presidents.

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *GENERAL FITTINGS CO.*—Greg Magratten, sales representative in western New York State.

▸ *GORTON HEATING CORP.*—L. W. Kelley & Assoc., sales representative for valves in North and South Carolina.

▸ *J. F. PRITCHARD & CO.*—The Frank K. Donnelly Co., sales representative for state of Washington.

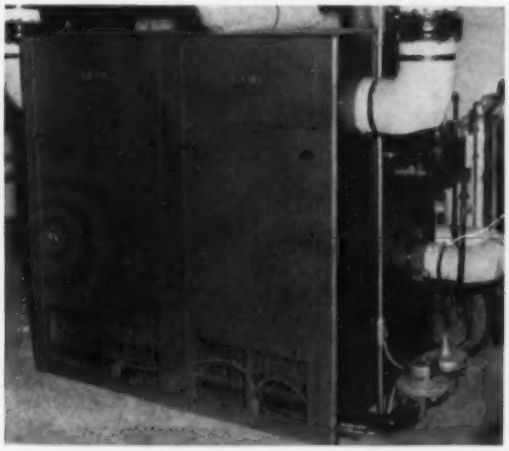
▸ *AMIC MFG. CORP.*—Fred Duffield to head new Amic Air Conditioning, Ltd., offices in Toronto, Canada.

▸ *CONOFLOW CORP.*—E. K. Graham Co., sales agent for Houston-Gulf Coast territory.

▸ *MAID-O'-MIST, INC.*—C. L. Boyer & Co., representative for Montana.

An "Extra Value" Gas Boiler

For schools, apartments, institutions, commercial and industrial buildings



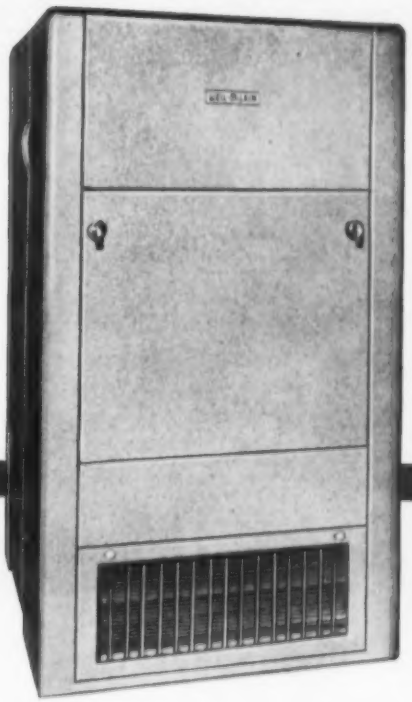
In every detail of construction Weil-McLain Type "J" Gas Boilers are designed to achieve *economy!* Not only in fuel consumption—but in all the factors which contribute to economical operation.

This boiler is *cast iron*—for long life and minimum repairs and maintenance. It's compact in design, requiring less floor space and head room. It can be maintained at top efficiency with little attention. Critical examination of its design reveals constructions which assure greatest efficiency in burning fuel and absorbing heat.

The Weil-McLain Type "J" Boiler burns all gases, including LP and LP-air and is equipped with controls for completely automatic, safe operation.

EASIER TO INSTALL

Sections are low in weight. Assembly with short draw rods instead of a single long rod simplifies installation—assures a strain-free assembly. One man can assemble jacket after piping is completed.



WEIL-McLAIN

TYPE J
GAS FIRED BOILER

Available in single and multiple units in capacities from 348,000 to 3,108,000 BTU. Send for Bulletin T-196.

MINIMUM SPACE REQUIRED

Compact design permits installation in small boiler room—saves construction costs. The draft diverter is joined to the collector hood in a horizontal position, decreasing the amount of headroom needed.

EASIER TO CLEAN

Cleaning at regular intervals is necessary for efficient operation of a gas boiler. In the Type "J" simply pulling out the clean-out plates makes the spaces between the sections accessible for inspection and easy cleaning.

WEIL-McLAIN BOILERS · RADIATORS

WEIL-McLAIN COMPANY

MICHIGAN CITY, INDIANA

Address literature requests to Dept. AA-46

What are your requirements in industrial thermometers?

- Easy Reading?
- Accuracy?
- Sensitivity?
- Flexibility?
- Ruggedness?

USG GOTHAM assures them all

The Red-Reading Mercury tube is today a standard for easy-to-read Industrial Thermometers.

USG Gotham Thermometers are built to withstand long, hard usage and maintain maximum accuracy and sensitivity.

They are available for straight mounting, 90° back or side angle, incline or recline and multi-angle mounting. Separate sockets and other accessories can also be furnished when specifications require.

Investigate the Gotham line before you specify. Write for Catalog No. 101.

USG UNITED STATES GAUGE

Gauge Headquarters FOR OVER 50 YEARS

Home of the SUPERGAUGE

Division of American Machine and Metals, Inc., Sellersville, Pa.

WHO'S WHAT *Continued*

▸ *CHICAGO NIPPLE MFG. CO.*—T. A. Rockett Co., representative for Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, Connecticut.

▸ *CARRIER CORP.*—Herbert E. Miller, branch manager, Washington office for the Unitary Equipment Div.

▸ *DUNKIRK RADIATOR CORP.*—William Sedlack, representative for heating line in northern New Jersey area.

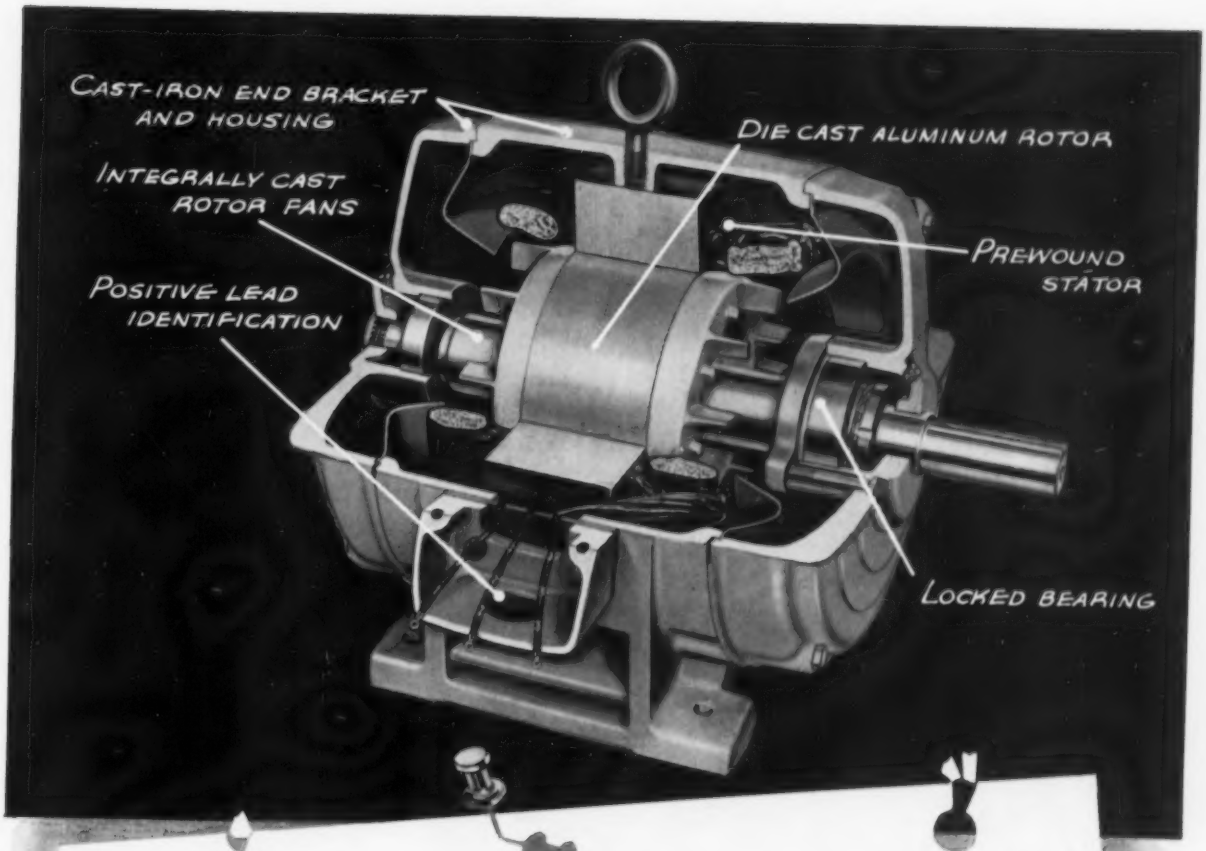
▸ *DE LAVAL STEAM TURBINE CO.*—W. H. Mouquin, district manager, Chicago office; C. C. Bray, regional sales supervisor, Chicago office.

▸ *AUTOMATIC SWITCH CO.*—Pierre Lenmark Co., representative for solenoid valves and electromagnetic controls in parts of Iowa, in Minnesota, North Dakota, South Dakota, western Wisconsin, upper peninsula Michigan.

▸ *INTERNATIONAL NICKEL CO., INC.*—Michael C. McFadden, Jr., technical field section, Atlantic Coast region.

▸ *O. A. SUTTON CORP.*—Emil Rasa, district sales manager. Mr. Rasa will supervise the sale of air circulators and air conditioners in the Cleveland area which includes Detroit, Toledo, Buffalo, Syracuse and Rochester.

▸ *FAIRBANKS CO.*—John H. Collamore, Jr., assigned to Rhode Island sales territory.



Are you getting all these extras in the motors you buy?

Louis Allis gives them to you, because they build their standard motors with special care

For years, Louis Allis has specialized in special motors for many of industry's toughest drive problems. Such installations call for extreme care in both motor design and manufacture—care that has become a habit with us. That's why we build our standard motors with special care.

What does this mean to you? It means that you get a motor with extra features —a motor that runs better, lasts longer. Here are a few of the extra reasons why:

- New exclusive phenolic impregnating varnish provides high thermal and chemical resistance. It remains resilient and resists aging for longer motor life.
- Locked bearings, inner race to shaft, outer race to end bracket, reduce end play and increase bearing life.
- Increased protection not only for the motor, but also for operating personnel. Double end ventilation permits maximum end bracket enclosure—prevents foreign matter from entering motor.
- Quiet operation obtained by careful design and test. Close manufacturing tolerances assure perfect alignment and minimum electrical noise.

There are many other features such as cast iron construction, positive lead identification, split conduit box—but our new bulletin No. 1700 describes all the many extras you get in a Louis Allis standard motor. Write for your copy.

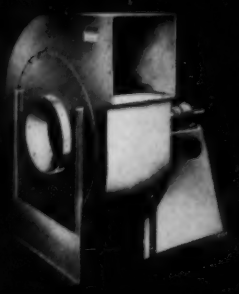
A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-109

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

Use the Best . . . Use Westinghouse for Fume, Vapor and Dust Exhaust!

VENTILATING SETS
Completely self-contained for indoor or outdoor installation. Two types: Direct connected or V-belt driven.



INDUSTRIAL FANS
For dust control, collecting and conveying wastes or raw materials.

SILENTVANE FANS
Quiet and efficient . . . designed for wide range of commercial and industrial uses.

AXIFLO FANS
High efficiency, large volume. Available in straight-through and elbow types.

*No. 2 of a Series

Put Air to Work Economically for:

1. Heating and ventilating
2. **FUME, VAPOR AND DUST EXHAUST**
3. Make-up air for balanced ventilation
4. Cooling and dehumidifying
5. Electronic Air Cleaning
6. Mechanical Draft for Steam Boilers

For complete application service, call your Consulting Engineer or your nearest Sturtevant Division Sales Engineer . . . or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 14-D, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80681

WHO'S WHAT

Continued

▸ *MITCHELL MFG. CO.*—CBS Columbia, distributor for air conditioning equipment in Buffalo trading area.

▸ *McQUAY, INC.*—William Swaim, heating and air conditioning representative, Rock Island, Illinois territory.

▸ *CORY CORP.*—Jack Lunney, territory manager for north and west Texas and southern Oklahoma with headquarters in Dallas, succeeding Frank Thompson who has been transferred as territory manager to cover a larger region in Kansas, eastern Missouri and northern Oklahoma with headquarters in Kansas City.

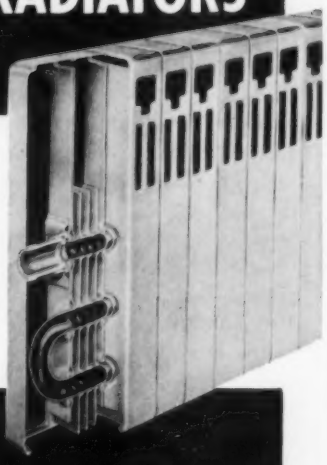
▸ *HAMMEL-DAHL CO.*—E. B. Miller Co., sales representative for the St. Louis territory.

▸ *CHASE BRASS & COPPER CO., INC.*—Robert Lea, district manager of Indianapolis warehouse and sales office. Mr. Lea succeeds Ralph H. Stroth, who has been appointed district manager for Chase in Pittsburgh.

▸ *SPORLAN VALVE CO.*—Edward P. Sullivan has joined the company's field sales organization and will work with E. C. Fockler out of the Chicago office in order to expand coverage of the Chicago, Wisconsin, Minnesota, North Dakota and South Dakota area.

▸ *E. I. DU PONT DE NEMOURS & CO.*—Samuel N. Seely, manager, western district of "Kinetic" Chemicals division; R. E. Thomas, Jr., office manager; R. M. Dahlen and D. W. Nesbit, Jr., technical sales representatives in the Los Angeles and Seattle areas, respectively.

SHAW PANEL RADIATORS



. . . designed for PROPER distribution of 2 kinds of heat

"Heat conditioning" a room requires 2 kinds of heat: *radiant* heat to warm solid objects, and *convected* heat, to warm the atmosphere.

Shaw Radiators deliver these two kinds of heat in unvarying, health-guarding proportions that only Nature, at her best, can duplicate. Shaw's exclusive AIR-e-ATED Radiant Heat is an engineered combination of radiant and convected heat that creates and maintains *natural* comfort in room areas.

AIR-e-ATED Radiant Heat is made possible by Shaw's completely self-contained design, which features full length steel heating fins and exterior radiant panels permanently bonded to the hot water or steam heating coils. Shaw-distributed heat is the standard by which we judge our individual comfort.

Write today for full information. And ask for your free copy of "Solving Modern Room Heat Distribution Problems".

SP-12

MANUFACTURED BY
SHAW-PERKINS
201 EAST CARSON ST. • PITTSBURGH 19, PA.

WHO'S WHAT

Continued

▸ *JOSEPH T. RYERSON & SON, INC.*—John J. Hauptly, acting manager of the inside sales department; Richard L. Smith, successor to Mr. Hauptly as manager of alloy steel sales; Edward J. Byers, manager of tubular products and cold finished bar sales; Robert F. Philpott, sales representative for the "Ryertex-Glyco" department.

▸ *OLIN MATHIESON CHEMICAL CORP.*—Austin Powder Co., dealer for Ramset Fastening System to cover Ohio, Michigan, Pennsylvania, West Virginia, Virginia, Kentucky, Indiana, Tennessee, North Carolina, Georgia.

▸ *BRUNER CORP.*—Edward J. Wilson, Indiana district sales representative; L. J. Prues & Associates, direct factory representatives for water softener equipment in the southern California area, succeeding Richard E. Feldt, who has been shifted exclusively to the domestic water softener field in the same area.

▸ *BEAVER PIPE TOOL, INC.*—Gordon Burke, district manager of Kansas City office covering Missouri, Kansas, Nebraska, and Iowa.

▸ *AIRTEMP DIVISION, CHRYSLER CORP.*—John Tuttle, assistant regional manager for the Detroit sales district; Temp-Aire Wholesalers, Inc., St. Louis, distributor for Airtemp commercial air conditioning equipment.

▸ *REYNOLDS METALS CO.*—Richard J. Dewhurst, to head new sales office in Newark covering 11 counties in New Jersey, five adjoining counties in New York State.

▸ *BRISTOL CO.*—W. C. Van Leuven, midwest regional sales manager, socket screw division.

COOLING WITH STEAM

C. H. WHEELER STEAM JET EJECTORS

In most cases if a process steam system is large enough for heating in winter, it can be used economically to provide air conditioning in the summer, because the increased steam load costs less per pound than the part load for process alone. A C. H. Wheeler Steam Jet Ejector system becomes most economical when air conditioning requirements exceed 100 tons. By means of this system water is chilled to as low as 50-55°F. with steam pressure of 50 psi or over. C. H. Wheeler has always led in the development of the steam jet ejector and its application to industrial refrigerating requirements. We invite your correspondence.

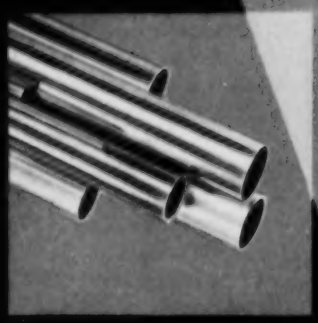
(Catalog 1462 is available.)

Note: In many areas utilities offer an attractive street steam rate in summer, which makes the steam jet ejector system economical for air conditioning large commercial and public buildings.

WE-509

C.H. Wheeler of Philadelphia
19TH AND LEHIGH AVE., PHILADELPHIA 32, PA.

Searching for the
BEST in
COPPER
TUBING?



If your product requires quality copper tubing — tubing manufactured to the most precise tolerances . . . then specify United! From a quality-controlled tube mill you can depend on clean, uniform, copper tubing held to your strictest specifications for temper and size. Look to United for the answer to all of your tubing problems. (Aluminum, Copper or Brass Alloys)

For brazing — United's Phoson brazes at the lowest practical brazing temperature, yet forms super strength joints.

UNITED WIRE
AND SUPPLY CORP.
Providence 7, Rhode Island

Permanently United
COPPER, BRASS AND ALUMINUM WIRE AND TUBING, AND BRAZING ALLOYS

WHO'S WHAT *Continued*

▸ *PENNSYLVANIA SALT MFG. CO.*—Jay Miller, chemical specialties representative, has taken on additional responsibilities for the Pennsalt metal processing department in his south central Pennsylvania territory. Mr. Miller succeeds Brooks Ricca who is now servicing the Philadelphia area. Other appointments: John Mordica, field sales supervisor, drawings lubricants, operating out of the Chicago territory; W. Scott McCormick, sales representative; Gene Edwards, technical service engineer. Both Mr. McCormick and Mr. Edwards will serve the Pittsburgh district.

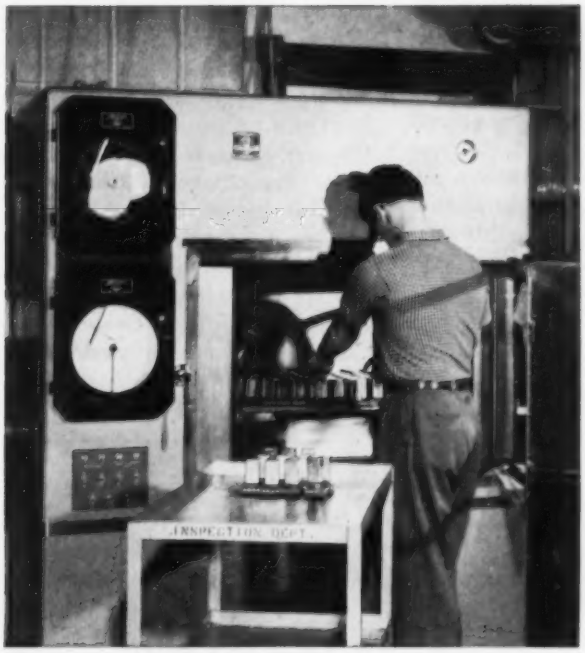
▸ *JOHNSON SERVICE CO.*—Henry A. Bickel, transferred to the company's Seattle office.

▸ *ROCKWELL MFG. CO.*—Thomas O. Carson, head of valve division's district sales headquarters offices in Pittsburgh; C. B. Goff, Jr., and A. J. Komich, assistant product managers, respectively, of "Nordstrom" valves and petroleum and industrial meters. Both will make their headquarters in Pittsburgh. Raymond G. Hatton, and Frank H. Endean, sales engineers, Rockwell Canadian sales office.

▸ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Martin Laughlin, sales representative covering Vermont, Connecticut, western Massachusetts, and eastern New York state; James B. Scudder, sales representative out of New York office; John F. Gibney, sales representative covering Maine, Rhode Island, New Hampshire, and northeastern Massachusetts.

▸ *ROBERTSHAW-FULTON CONTROLS CO.*—David D. Gordon, sales manager, Fulton Sylphon Div., for the Los Angeles District, succeeding W. J. Hajek, who has been transferred to the Chicago office.

Taylor controls Weather made by "Climate-Lab!"*



Both humidity and temperature are precisely controlled in the "Climate-Lab" test apparatus, developed and marketed by the American Instrument Company, Silver Spring, Md. The control system employs a Taylor Time Schedule Double Duty Recording Controller, whose control settings are varied automatically by shaped cams to produce various time, temperature and humidity programs. It also provides a minute-by-minute chart record.

This apparatus is equally adaptable to research, development or production. Among its many applications are: testing various types of equipment and containers; checking products destined for government use to insure compliance with specifications; testing packaging of food and other products for resistance to or retention of moisture; atmospheric corrosion studies; research on the effects of climatic conditions on seeds, plants, animals, etc.

Taylor has the instrumentation and the know-how to provide the answer to many tricky problems in the field of air-conditioning. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*TRADE MARK REGISTERED

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

ADSCO

OFFERS A COMPLETE SERVICE IN THE DESIGN AND MANUFACTURE OF ENGINEERED EQUIPMENT FOR THE PROCESSING AND HEATING INDUSTRIES

Last year, ADSCO Industries, Inc., purchased Farrar & Trefts, Inc., and the Alberger Heater Division of Howard Iron Works, Inc. The integration of these two well-known and highly respected concerns into the ADSCO family is now complete . . . with results of great importance to purchasers of equipment for the heating and processing industries.

Heat exchangers for the process industries from Alberger . . . heating and power boilers and plate fabrication from Farrar & Trefts . . . packed and packless expansion joints, pipeline accessories and water and oil heaters and coolers from American District Steam . . . steel and alloy plate and pipe fabrication, structural work, and heat exchangers from California Steel Products on the West Coast.

That's the line-up at ADSCO now!

Where else can a buyer find such a diversified array of equipment that is vital to the heating, chemical, oil, gas, food, pharmaceutical, mechanical, power and atomic energy industries?

The ability of one company to be integrated and yet so diversified is bound to work for the benefit of its customers. Better engineering . . . broader manufacturing facilities . . . greater efficiciency . . . faster deliveries . . . greater teamwork . . . increased purchasing power of materials at lower cost . . . standard designs of equipment that others custom-make . . . and an East-West operation with great differentials in freight rates.

The list of advantages is indeed long. Call upon ADSCO and see first hand what impressive things this new, closely-knit, comprehensive firm is doing.

ADSCO INDUSTRIES, INC.
MAIN OFFICE BUFFALO N. Y.
PLANTS
BUFFALO N. Y. – RICHMOND CALIF.

ALBERGER HEATER DIVISION
Process heat exchangers in steel alloy and impervious graphite • HCl absorbers

AMERICAN DISTRICT STEAM DIVISION
Packless and Slip-type Expansion Joints
Pipeline Accessories • Water Heaters • Suction Heaters
Oil Heaters • Coolers • Heat Reclaimers

CALIFORNIA STEEL PRODUCTS DIVISION
Steel and Alloy Plate • Structural • Pipe • Heat Exchangers

FARRAR & TREFTS DIVISION
Boiler-Burner Units • Heating and Power Boilers
Steel and Alloy Heavy Plate Construction • Pressure Vessels

WHO'S WHAT *Continued*

▸ *BAILEY METER CO.*—John J. Wilber, manager of Cleveland district sales office. He succeeds C. C. McClelland, retired.

▸ *TOLEDO PIPE THREADING MACHINE CO.*—Blake Wilson, regional sales manager, North Central area sales; Marvin Cox, regional sales manager, western regional sales; R. W. Warnke, regional sales manager, east north central territory as well as eastern Canada; W. L. Gahman, regional sales manager, East Coast region of New England and middle Atlantic states; H. R. Strouse, regional sales manager, Southeastern territory including Texas, Oklahoma, Louisiana and Mississippi.

▸ *YORK-SHIPLEY, INC.*—John G. Mitroka, district representative for northeast Pennsylvania territory; Thomas N. Ridgaway, Jr., a similar appointment for Maryland; Harold W. Blakley, sales manager, new sales office in Ontario, Canada.

▸ *HEIL CO.*—Tri-County Supply Co., appointed wholesaler for furnaces, boiler-burner units, conversion burners and summer air conditioners in northern Ohio.

▸ *PERFECTION INDUSTRIES, DIVISION OF HUPP CORP.*—Marion Miller, Midwest regional manager; F. J. Rudolph, assistant to general sales manager Donald G. Wright; Harold Kiefer, western sales representative covering Washington, Oregon, Idaho, as well as Alberta, Saskatchewan, British Columbia in Canada.

▸ *TRION, INC.*—William F. Watson, sales manager, Pittsburgh region.

▸ *YORK CORP.*—Electric Constructors, Inc., wholesale distributor of room air conditioners for Birmingham area.

▸ *A. O. SMITH CORP.*—J. Wayne Burleson and W. T. Halket, assistant general sales managers; W. A. Dunn, manager, New England area and Metropolitan New York; C. L. Hewitt, Jr., manager, heating and air conditioning products; Don Shafer, manager, Dist. 73 out of Pittsburgh, succeeding Ken O'Gorman who moves to Chicago. Mr. O'Gorman succeeds L. H. Hoelter who has become building products manager for "Permaglas"; Herman Johnson, eastern manager of commercial water heater sales out of Philadelphia; John L. Stewart, West Coast heating and air conditioning specialist.

more indoor comfort, winter or summer!

Air comes in like a Lion goes out like a Lamb

...with Standard Ceiling Air Diffusers and Baseboard Intakes!

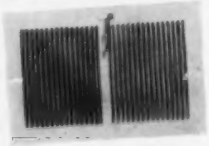
Standard's Ceiling Air Diffusers and Baseboard Intakes can supply a tremendous volume of air per outlet, without creating objectionable air motion. The Diffusers combine higher air induction rates with gentle distribution, for *full dimension comfort*. The Intakes provide draft-free air return. The result is more solid indoor comfort, winter and summer!

STANDARD

... first in engineering for indoor comfort!

MAIL COUPON TODAY FOR NEW FREE CATALOG OF THE COMPLETE STANDARD LINE!

CEILING AIR DIFFUSERS
Flush or Extended Models; also dampers and installation rings. For 6"—14" ducts. Beautiful tan metallic finish.



BASEBOARD INTAKES
4216 or 32V, with horiz. or vert. adjustable bars. All sizes. ½" projection all sides for easy installation, smart styling.

STANDARD STAMPING & PERFORATING CO.
3125 W. 49th Place Chicago 32, Illinois

Gentlemen: Please send me your new catalog showing Standard's complete line of registers and grilles.

Name_____

Company_____

Address_____

City_____ Zone____ State____

WE HEAR THAT . . .

▸ As a further step in its expansion program, *CARRIER CORP.* will spend $12 million during 1956 for new buildings and equipment at its Syracuse headquarters, the company reports. Present plans call for new administration, personnel and research and development buildings.

▸ As a result of a half-million dollar fire which spared only the *BALTIMORE AIRCOIL CO.'s* new brick warehouse containing raw material and completed units which will be used to help fill outstanding orders, the principals of the company have arranged to manufacture their "M" line of cooling towers and evaporative condensers almost immediately. Construction of a completely new plant will begin at once and is expected to be finished and in full operation by July.

▸ *ARMCO STEEL CORP.* is sponsoring a new scholarship program designed to encourage high school seniors to study engineering or physical science. The program provides for 16 scholarships to be awarded each year to outstanding seniors chosen from high schools in the communities in which Armco plants are located.

▸ Acquisition of the *GEORGE H. JACKSON CO., LTD.* Canada, by *ROBERTS-GORDON APPLIANCES CORP.*, Buffalo, has been announced by *W. STUART GORDON, JR.*, president. The Canadian firm manufactures metal stampings, dies, forgings and investment castings.

▸ *REDMOND CO.*, is now in the process of completing a new plant in Angola, Indiana. This plant was designed specifically to produce a new style motor that Redmond is adding to its line of fractional horsepower motors.

▸ Sales of *BELL & GOSSETT CO.* crossed the $25 million mark last year, a record number of 300,000 pumps were manufactured, and the net after taxes was up 63 percent over the preceding year, according to *R. E. MOORE*, executive vice president and secretary. The occasion for his remarks was a luncheon held in Chicago.

▸ *ROBERT H. COLLINS* has purchased the interest of *FRANK GAINES* in *GAINES-COLLINS*. The newly formed *COLLINS MACHINERY CORP.* will take over Gaines-Collins' headquarters in Los Angeles.

from shops to emporiums —

MT. HAWLEY

BOILER-BURNER UNITS

keep a shopping center comfortable

THE PROBLEM:
Sheridan Village, above, a huge new shopping center, let the subcontract for the heating and air conditioning with one stipulation; each of the 24 stores, regardless of size, was to receive its own individual heating bill. Heat loss figures for the stores varied from well under 100,000 Btuh to over 500,000 Btuh.

THE SOLUTION:
The heating contractor installed two dozen compact Mt. Hawley gas fired Boiler-Burner units. By utilizing a hot water coil to air system, each store regardless of size had its own heating and air conditioning system. Above is a typical installation. The range in sizes was from the Mt. Hawley W-510 with 80,000 Btuh output to the Mt. Hawley A-210 with a capacity of 567,000 Btuh. (Other Mt. Hawley Boiler-Burner units with ranges up to 720,000 Btuh.)

From a cottage to a cathedral . . . a filling station to a field house . . . there's a Mt. Hawley Boiler-Burner unit designed for the job. Clean, space-saving design and efficient, dependable operation make Mt. Hawley the choice for both "run of the mill" installations and those involving special problems.

Today—write, wire or phone Peoria 2-5448 collect for free literature and prices, at no obligation.

See Mt. Hawley Booth No. 615 At the 74th annual NAPC show.

MT. HAWLEY FULLY AUTOMATIC OIL BURNERS—A size for any heating need. Efficient . . . long-lived . . . compact . . . silent

MT. HAWLEY MFG. CO.

Dept. H-4 Routes 174 & 88 Peoria, Illinois

WE HEAR THAT

Continued

▸ Underway at the *PEERLESS ELECTRIC CO.* are plans for an expanded line of fans and blowers and increased production volume. The new building, a $350,000 fan and blower plant, is a part of a half-million dollar expansion program. It is predicted by company officials that Peerless will soon be producing about 400 different models of fans and blowers.

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.* conducted a five-day training course to increase "creative sales" for 19 owners, sales managers, and other executives of heating and air conditioning wholesale firms. This is the second such course to be conducted by the company.

▸ *PLOMB TOOL CO.* has acquired certain assets of *TUBING APPLIANCE CO., INC.*, including essential machinery, tooling, patents and inventories of the latter company's ratchet wrenches. All physical assets involved have been moved to the Plomb plant in Los Angeles where manufacture of the wrenches as "Pro-to-Tac" tools has already been started.

▸ *JAMES B. CLOW & SONS, INC.* will build a $4 million plant in Bensenville, Illinois as part of a $5 million expansion program. *JOHN MADDEN*, president, said the decision to expand resulted from current and anticipated iron pipe demands.

▸ *DUNKIRK RADIATOR CORP.* has just completed construction of a new addition providing over 7000 sq ft for the machining and assembly of radiators.

▸ *L.O.F. GLASS FIBERS CO.* has more than doubled its plant facilities in Burbank, Calif., with the recent lease of a 15,000 sq ft building, and a 75 × 200 ft lot there. The original Burbank plant adjoins the recently acquired properties.

▸ The firm of *S. W. BROWN* has been engaged by the Moore-McCormack Lines as consultants for the air conditioning of the two luxury liners to be constructed for the lines by Ingalls Shipbuilding Corp. S. W. Brown, head of the consulting firm, has been associated with the engineering and design of air conditioning and refrigerating systems on more than 10,000 ships, including all but one of the passenger liners built in the United States in the past 15 years.

▸ *COASTAL EQUIPMENT CO. INC.*, has been acquired by *YORK CORP.* it was announced by *J. K.*

New compactness in air-cooled AIR CONDITIONER design!

Smallest air-cooled, self-contained (not remote) 5-ton central type unit made.

5 natural wood-grain finishes available on all free-standing models.

Completely automatic, thermostat controlled, air-cooled condenser.

MODEL RO-525A
(with air distribution head)

MODEL NO.	NOMINAL CAPACITY	TOTAL COOL. B.T.U.	COOLING C.F.M.	OUTSIDE DIM.
FL-2	2 Ton	24,000	900 @ .3 S.P.	30Wx21Dx43H
RO-26	2 Ton	24,000	1000 @ .3 S.P.	30Wx21Dx34H
RO-31	3 Ton	36,000	1200 @ .2 S.P.	30Wx23Dx38H
RO-31 H.P.	3 Ton	37,700	1400 @ .3 S.P.	30Wx25Dx40H
RO-525 A	5 Ton	65,500	1800-2400 @ .3 S.P.	40Wx26Dx57H

Thermostat has 3 positions: Continuous – Automatic, Fan & Compressor – OFF.

Complete air conditioning for entire home — or equivalent commercial or office area — at the lowest cost in smallest space! GENERAL AIR CONDITIONERS deliver 2, 3 or 5 tons of cooling. All models operate on standard outlet (220 V, single and 3 phase except 2-ton — single phase only).

Attic, roof, outside, or free-standing units

NATIONWIDE SALES AND SERVICE

Offices and warehouses:
LOS ANGELES • ATLANTA
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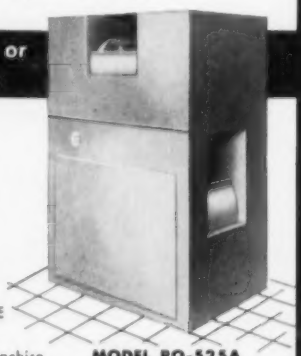
WRITE today for details. Franchise dealerships available.



MODEL RO-525A
(without air distribution head)

Main Office
GENERAL AIR CONDITIONING CORP.
Dept. S-22 • 4542 E. Dunham St.
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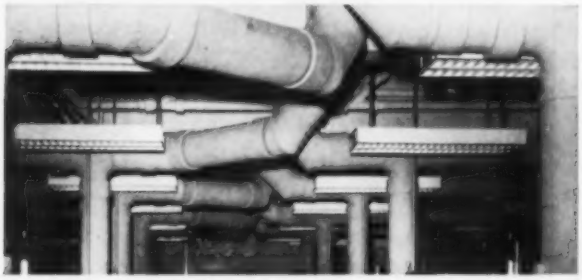
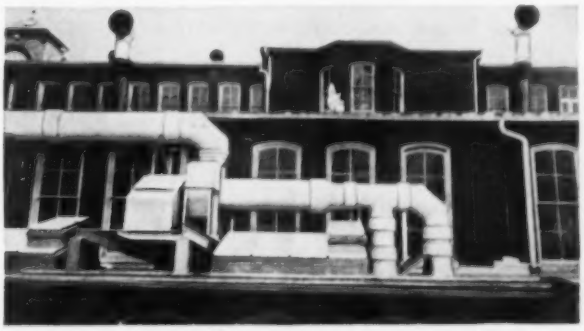
FIVE YEAR GUARANTEE — easy payment plan

Lick vent problems...



caused by corrosion...



...and by weather

with

TRANSITE INDUSTRIAL VENT PIPE

WITH Transite® Industrial Vent Pipe you're sure of long, trouble-free service—thanks to the twofold protection it provides:

INSIDE, Transite protects against the corrosive action of fumes, vapors and dusts that must be removed from research laboratories and industrial plants.

OUTSIDE, it protects against all kinds of weather! Never needs painting or other preservative coatings. Needs no maintenance.

Transite Industrial Vent Pipe offers other advantages, too. A wide variety of fittings and pipe sizes makes it adaptable to every industrial venting service. The ease with which this pipe can be cut and handled on the job makes for important installation economies.

For additional information about the use of Transite Industrial Vent Pipe for your venting problems—inside and out—write to Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ont.

Johns-Manville

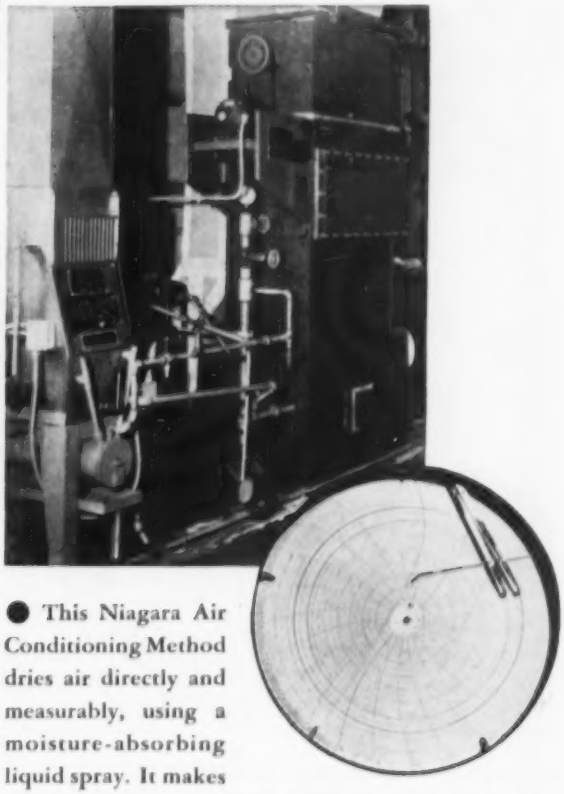
TRANSITE INDUSTRIAL VENT PIPE

AN ASBESTOS-CEMENT PRODUCT

EXACT CONTROL

of Moisture Content

To Improve Your Product or Protect Your Materials or for Processes or Tests



● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for Descriptive Bulletins #112 and #121. Address Dept.— HP

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District Engineers in Principal Cities of U. S. and Canada

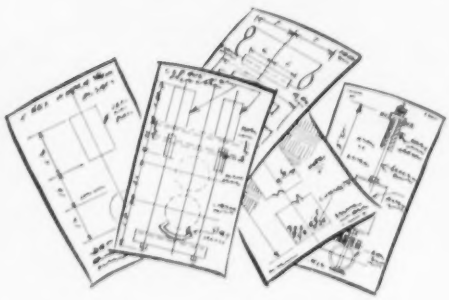
"WITCH"

PIPE HANGERS

FOR

HEATING – PLUMBING
POWER & PROCESS

GOT A TOUGH PIPE
HANGING PROBLEM?
FORGET IT!!!
YOUR TOUGH PROBLEMS
HAVE BEEN OUR BUSINESS
FOR 42 YEARS



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ACROSS THE NATION

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WE HEAR THAT *Continued*

LOUDEN, vice president, York commercial division. Coastal Equipment was formerly a distributor for York in Houston, Texas.

▸ *ROCKWELL MFG. CO.* has released a new 16-mm sound movie titled "Beyond the Mains" which explains the reasons for metering and shows in detail how LPG fuels meters are made and tested. The film also shows how meters operate and the standards of accuracy they are required to meet.

▸ *SQUARE D CO.* has allocated $9 million for new plants and other improvements to be completed during the next 22 months. The $3 million Milwaukee plant will be one of the first in the expansion program.

▸ American Controls Div. of *ROBERTSHAW-FULTON CONTROLS CO.* has established a unified engineering department at its St. Louis plant. The newly created engineering department, along with developing its own engineering data, is formulated to bring under single direction all testing and quality control functions at the division.

▸ *ROBINSON CLAY PRODUCT CO.* is observing its 100th anniversary this year. Commemoration of the milestone will be keyed to the theme, "100 years of quality and service." A special promotional program will highlight the observance.

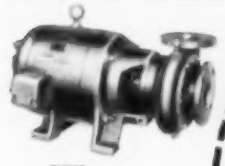
▸ *LENNOX INDUSTRIES, INC.* is bringing its line of products to its dealers by means of a caravan equipped with samples of new air conditioning equipment, furnaces, and a new campaign outline, traveling across the country.

▸ *MICRO SWITCH*, a division of *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, has opened a new factory near Independence, Iowa. The new building replaces temporary facilities occupied by the firm for the past year.

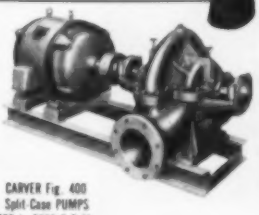
▸ The national Red Feather award for outstanding volunteer service to the nation's 1900 United Funds, Community Chests, and Community Welfare Councils has been presented to *ALBERT J. NESBITT*, president of *JOHN J. NESBITT, INC.* Mr. Nesbitt is retiring president of Community Chests and Councils of America which gave the award at its biennial conference.

▸ The first tri-annual meeting of 1956 of the *VERTICAL TURBINE PUMP ASSN.* was held in Phoenix,

CARVER has the PUMPS... TO FIT YOUR NEEDS!



CARVER
L & H PUMPS
30 to 900 G.P.M.



CARVER Fig. 400
Split-Case PUMPS
200 to 2000 G.P.M.

Whatever your requirements, there is a pump in CARVER'S Complete Line that will give you outstanding performance over a wide range of capacities and heads. CARVER . . . your best buy for better pumping.

CARVER PUMP CO.
1460 Hershey Ave.
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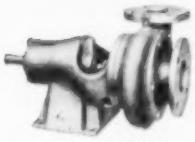

CARVER
Type FL PUMPS
20 to 900 G.P.M.

CARVER
MODEL B PUMPS
6 to 150 G.P.M.

CARVER Model KF PUMPS
Self-Priming
20 to 4000 G.P.M.

Ask for bulletins

CARVER
the quality name in pumps

FOR FLEXIBLE CONNECTIONS IN

● DUST COLLECTION ● FUME CONTROL
● AIR-CONDITIONING ● MATERIALS HANDLING

PORTOVENT® ◀◀◀ **USE** ▶▶▶ **FLEXAUST®**

Spiral wire reinforced
DUCT

Sizes 3" to 36" ID Wide
Pitch type RETRACTABLE

Flexaust hoses and Portovent ducts are made with strong cotton or nylon fabrics, impregnated and coated with neoprene compounds. Seams are fully bonded. Other important features are—

- ✔ EXTREME FLEXIBILITY
- ✔ AIRTIGHT — STRONG
- ✔ LIGHTWEIGHT — DURABLE
- ✔ VERY EASY TO HANDLE AND INSTALL

STOCKS IN PRINCIPAL CITIES

Spiral wire reinforced
HOSE

Sizes 1¼" to 36" ID
Close pitch type

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Bulletin #40 — General information
Bulletin #41 — Accessories and Installation Data
Bulletin #42 — Technical data on products and service.
Bulletin #43 — Application data and type selector guide.
Bulletin #44 — Friction loss data.
Prices lists.

THE FLEXAUST COMPANY, Dept. HP-4

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Specify Raypak
Copper tube forced hot water boilers
...with exclusive gas modulation —sizes the boiler for the job!

Approved by A.G.A.

Complies with A.S.M.E. code

12 Models fit every need

Check these features

Raypak boilers are specifically packaged for Radiant Panel, Baseboard, Radiator, Convector, Swimming Pool and Volume Hot Water Supply Systems and also are ideal companions to Air Conditioning Units.

1. Original "Plug-in" Boiler
2. 100% copper waterways last a lifetime
3. Triple the BTU's per pound of weight
4. Remarkably compact and durable
5. Laboratory tested at 2,000 psi—no failure

Raypak's skilled and specialized distributors and representatives are available any time for consultation on any wet heating problem.

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Please send me additional information and name of local representative.

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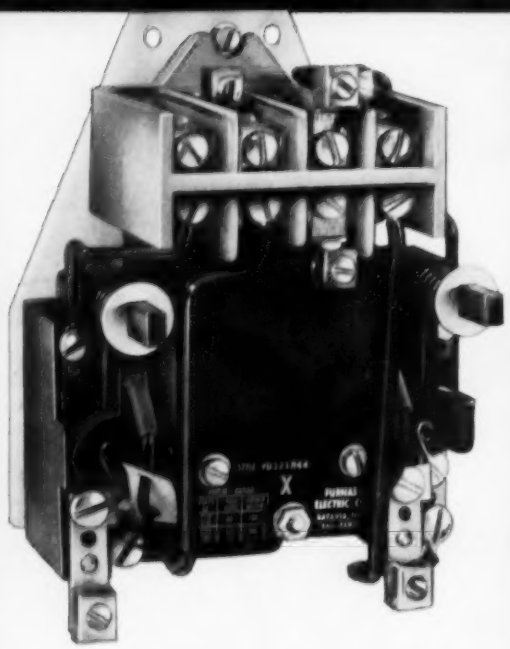
FURNAS ELECTRIC CONTROLS

do the best job for AIR CONDITIONING and REFRIGERATION



MAGNETIC CONTROLS FOR HERMETIC UNITS

As original and replacement controls for air conditioning and refrigeration units, these compact magnetic controls are available in ratings of 20, 30, 35 and 50 amperes sizes and are listed as standard by Underwriters' Laboratories. Also available is a complete line of magnetic control for open type compressor units for applications through 200 hp.

Write today for Air Conditioning Bulletin 5410, 1041 McKee Street, Batavia, Illinois.

FURNAS

FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in all Principal Cities

WE HEAR THAT

Continued

Arizona, January 30-31. *DR. HEINRICK J. THIEL*, consulting hydrologist, spoke on "The Pump Industry and Ground-Water Development Forecasts."

▸ The 1955 *NATIONAL ASSOCIATION OF CORROSION ENGINEERS* Junior Award, given annually for the best paper published during the year in the association's monthly periodical by an author under 35 years of age, was awarded to *EDWARD L. SIMONS*, a research associate in the Analytical Chemistry Unit, *GENERAL ELECTRIC* Research Laboratory, N.Y. Mr. Simons' paper is entitled, "Sodium Sulfate in Gas Turbines."

▸ *ANSUL CHEMICAL CO.* has had a perfect safety record for the second year in a row. The last lost-time accident occurred Nov. 24, 1953.

▸ *AMERICAN ENGINEERING CO.* has moved its main offices to a newly completed office building in the Frankford district of Philadelphia. This arrangement brings together all activities of the company.

▸ *CURTIS MFG. CO.* has established a new distribution policy. Curtis is now appointing wholesale distributors to handle its packaged lines for commercial and residential applications. The balance of the line will be handled by manufacturers' representatives.

▸ *MORSE CHAIN CO.*, a *BORG-WARNER* subsidiary, has acquired the *EBERHART-DENVER CO.*, and its affiliate, the *SPRECO CO.*, it was announced by *STANLEY J. ROUSH*, president of Morse. Eberhart-Denver is a manufacturer of speed reducers.

▸ *VALLEY MFG. CO.* is now producing lightweight steel pipe in 6 and 8 in. diameters. The new product is butt welded and is manufactured in 20, 30 and 40 ft lengths. Other lengths are also available.

▸ *CORY CORP.* has acquired a new warehouse at 25th and Federal Sts., Chicago. The 180,000 sq ft, multi-story structure will be used for the company's *FRESH'ND-AIRE* and *MITCHELL DIVs.*

▸ *WILLIAMS DIV., EUREKA WILLIAMS CORP.* has put its new line of automatic heating controls on wheels for unveiling to the trade in 63 cities. Three separate caravans, each housed in a large moving van, are being used. Each caravan will complete its tour on March 16. ≠

ON THE
Booming Florida Scene
DRAYER-HANSON AIR CONDITIONING

MORE

Seville Hotel, Miami Beach. Architect: Melvin Grossman/Air Conditioning Engineer: Sam L. Hamilton.

AND MORE

Hollywood Beach Hotel, Hollywood Fla. Architect: Melvin Grossman/Engineers: Sasnett Engineering.

AND MORE

Belle Isle Apartments, Miami Beach. Architect: Robert B. Swartburg/ Engineers: Altec Engineering Co.

AND MORE

Lucerne Hotel, Miami Beach. Architect: Carlos B. Schoeppl/Engineers: Altec Engineering Co.

A sure sign of the times in Florida — "Air Conditioning by Drayer-Hanson"! . . . in a wide variety of installations: the new Biscayne Shopping Plaza, La Gorce Country Club, Miami Sheriff's Station, El Sirocco Motor Hotel, many more. **Marked advantages to meet any requirements** with D-H Flexazone systems! Spotaire systems! HH and HHV systems!

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(Division of National - U.S. Radiator Corporation)

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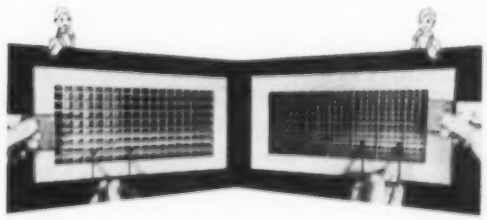
Featuring The R. & G. "TWINS"



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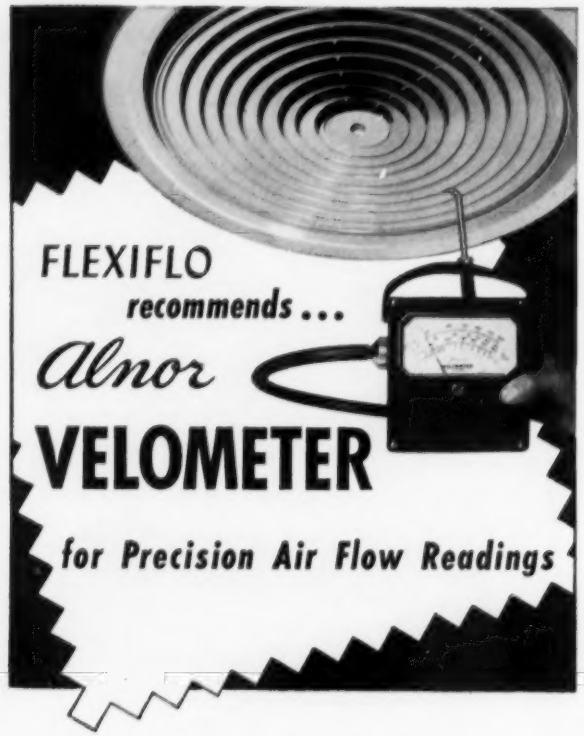

Experience has taught the Universal Diffuser Corporation that the Alnor Velometer minimizes time required to balance an installation of Flexiflo diffusers. They *recommend* the Alnor Velometer because they know it consistently measures *actual* air flow precisely and quickly.

The Velometer is the *only* instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low—compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

Get an Alnor Velometer for your air measurement needs. You'll save time and money wasted in balancing air distribution on your *next* installation. If you'd like a copy of Universal's instructions on balancing Flexiflo Diffusers with the Velometer, just send the coupon below.

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☐ Send Flexiflo Installation Manual
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MEETINGS & CONVENTIONS

APRIL 18-19—*National Industrial Research Conference.* Sherman Hotel, Chicago. Sponsored by Armour Research Foundation of Illinois Institute of Technology. Conference secretary: Joseph J. Kowal, Armour Research Foundation, 10 W. 35th St., Chicago 16.

APRIL 18-20—*Conference on Marine Corrosion and Fouling Problems.* La Jolla campus, University of California. Registration and information: University of California Engineering Extension, Los Angeles 24.

APRIL 19-20—*Science Section of the Environmental Equipment Institute,* second annual meeting. Sheraton Hotel, Chicago. Information: H. F. Sander, meeting chairman, care of Vapor Heating Corp., 6420 W. Howard St., Chicago.

APRIL 19-21—*Gas Appliance Manufacturers Association,* annual meeting. The Greenbrier, White Sulphur Springs, W. Va. Association headquarters: 60 E. 42nd St., New York 17.

APRIL 21-27—*Industrial Health Conference.* Convention Hall, Philadelphia. Information: Si Shaltz, Adelphia Associates, Western Saving Fund Building, Philadelphia 7.

MAY 4—*Annual Conference for Engineers.* Ohio State University, Columbus. Information and reservations: Harold A. Bolz, College of Engineering, Ohio State University, Columbus 10.

MAY 7-9—*Air Conditioning and Refrigeration Institute,* annual meeting. The Homestead, Hot Springs, Va. George S. Jones, managing director, 1346 Connecticut Ave., N. W., Washington 6, D.C.

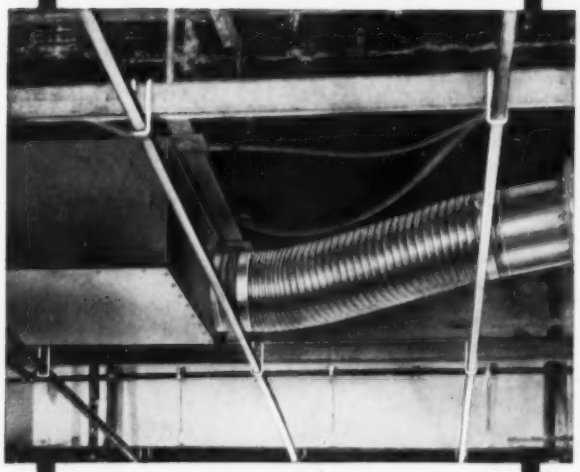
MAY 7-11—*American Welding Society,* national Spring meeting. Buffalo. AWS headquarters: 33 W. 39th St., New York 18.

MAY 9-10—*National Association of Corrosion Engineers,* northeast region meeting. University of Buffalo. NACE headquarters: 1061 M & M Bldg., Houston 2, Texas.

MAY 9-11—*Fourth Welding Show.* Memorial Auditorium, Buffalo. Sponsored by American Welding Society, 33 W. 39th St., New York 18.

Branch connections are

EASIER



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WIREMOLD *flexible* AIR DUCT

Bends easily without kinking

Wiremold Flexible Air Duct saves you TIME and LABOR • Connects air distributing units with branch ducts *easier* and *faster* • Solves misalignment problems • Allows for expansion and contraction of the system and prevents transmission of mechanical vibration • *Minimum waste* — short lengths quickly spliced on the job • *Lasts longer* — vinyl coated fiberglas fabric is *mechanically locked* into the strong steel spiral, eliminating glues or adhesives that dry out and crack.

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- Reverse Current Gas Travel
- Extra Heat Transfer Surface
- Completely Automatic
- Smooth, quiet operation

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STAINLESS STEEL combustion chamber. Floating design eliminates expansion and contraction stresses. Secondary heat transfer is provided with a multiple battery of 10 gauge boiler tubes. The extended flue gas travel and extensive heat transfer surface insures safe metal surfaces and long heater life.

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STAINLESS STEEL DIRECT FIRED HEATERS

ARTHUR A. OLSON & COMPANY • Canfield, Ohio

REPRESENTATIVES IN PRINCIPAL CITIES

MEETINGS & CONVENTIONS — *Continued*

MAY 9-12—*Sheet Metal Contractors' National Association, Inc.*, annual convention. Shoreham Hotel, Washington, D.C. J. D. Wilder, executive secretary, 170 Division St., Elgin, Ill.

MAY 11-12—*Michigan Engineering Society*, 76th annual convention. Pantlind Hotel, Grand Rapids. Information: D. B. Apted, 945 San Lucia Dr., Grand Rapids, Mich.

MAY 14-15—*Steel Boiler Institute*, annual meeting. Brown Hotel, Louisville. SBI headquarters: 1308 Land Title Bldg., Philadelphia 10.

MAY 14-16—*Commercial-Industrial Oil Burning and Equipment Workshop.* Kellogg Center, Michigan State University. Sponsored by Oil-Heat Institute of America, Inc. Information: Department of Mechanical Engineering, Michigan State University, East Lansing, Mich.

MAY 14-17—*American Society of Mechanical Engineers*, conference to coincide with First Design Engineering Show, Convention Hall, Philadelphia. Show sponsored by Clapp & Poliak, Inc., 341 Madison Ave., New York 17. ASME headquarters: 29 W. 39th St., New York.

MAY 15-18—*Heating, Piping and Air Conditioning Contractors National Association*, annual meeting. Kentucky Hotel, Louisville. HPACCNA headquarters: 30 Rockefeller Plaza, New York 20.

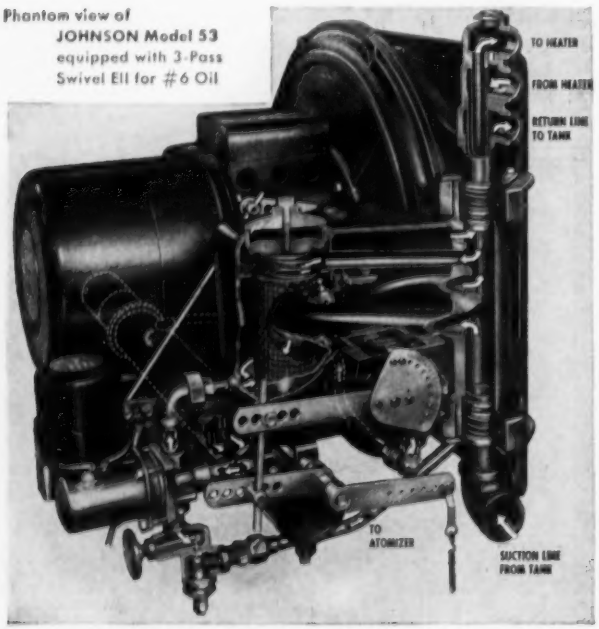
MAY 21-27—*Air Pollution Control Association.* Niagara Frontier annual meeting. Buffalo. Information: Harry C. Ballman, executive secretary, APCA, 4400 Fifth Ave., Pittsburgh 13.

MAY 22-25—*National Warm Air Heating and Air Conditioning Association*, board of trustees and committee meetings and technical conference. Edgewater Beach Hotel, Chicago. The Association is at 640 Engineers Bldg., Cleveland 14.

JUNE 3-6—*American Society of Refrigerating Engineers*, Summer annual meeting. Cincinnati. ASRE headquarters: 234 Fifth Ave., New York 1.

JUNE 4-7—*National District Heating Association*, 47th annual meeting. Inn and Lodge, Williamsburg, Va. John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

Phantom view of JOHNSON Model 53 equipped with 3-Pass Swivel Ell for #6 Oil



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Better Performance!
Lower Fuel Costs!

JOHNSON MODEL 53
METERING PUMP BURNERS

With this revolutionary new burner you get smooth, sure, automatic "Starts" even when the oil in storage tank and lines is cold and hard to pump. It is built with a positive displacement Metering Pump, a 3-Way Magnetic Oil Valve, and a high efficiency Suction Pump that enable the Fifty-Three to maintain a fixed air-fuel-ratio regardless of variations in oil temperature and viscosity. Never before has there been a burner which so successfully overcomes the "Cold Starts" problem.

The Fifty-Three is built in 8 sizes from 25HP to 500HP. It is available with Direct Drive or Belt Drive. Combination Oil and Gas models also are available. All models are fully automatic and equipped with finest electronic controls. For efficiency, easy servicing and all around economy, the Fifty-Three is the best oil burner buy on the market.

Johnson Oil Burners

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Builders of fine Oil Burner Equipment since 1903

SLANT-FIN

TELLS WHY THIS IS BETTER FINNED PIPE

Improved Design and Construction

IN BOTH "SLANT-FIN" AND "SQUARE-FIN" RADIATORS

1 **BETTER FIT OF FIN TO PIPE.** With exclusive equipment designed by Slant-Fin engineers, pipe is forced through undersize hole in fins under tons of hydraulic pressure. No weakening of pipe walls by expanding pipe or by fins cutting into pipe surface. The result is the **strongest mechanical union of pipe and fin.**

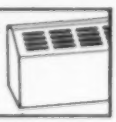
2 **PERFECT THERMAL BONDING.** On a special machine, standard pipe is rolled to uniform, absolutely round diameter. Wide flanges of fins press solidly against entire surface of pipe for **highest heat transfer efficiency.**

3 **PRECISION SPACING AND EXTRA STRENGTH.** For the flanges of the fins, Slant-Fin devoted much time to experimental engineering. Because of the uniformity of the flanges and their interlocking features, the **fins fit tightly one into another.**

4 **MORE EFFICIENT AIR CIRCULATION.** Because of the increased surface, **fewer** of the distinctive "V" shaped **slant fins** than the traditional square fins can furnish the same radiation per linear foot of pipe. Therefore, fins can be wider apart and a greater volume of air flows more freely.

5 **NO SNAPPING — NO BUCKLING OF FINS.** Because of the **patented notched flange,** the slant-fin can expand and contract without disturbing the bond to the pipe, even under high steam pressures. The result is a radiator that is trouble-free and **noiseless.**

RESIDENTIAL BASEBOARD HEATING
For Steam or Hot Water.
Choice of 3 Heating Elements and 2 Enclosure Styles.



CATALOG No. 505 gives details on the complete line of "Slant-Fin" and "Square-Fin" radiators and enclosures for commercial and industrial applications. BULLETIN No. R-602 supplies facts about residential baseboard heating. Write for your copy.

SLANT-FIN RADIATOR CORPORATION
87-65 130th Street, Richmond Hill 18, New York

more air - less horsepower....

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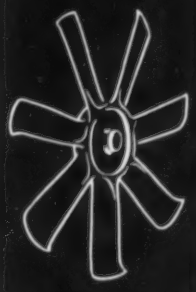
sp-7

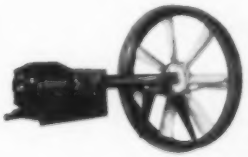


7-blade semi-pressure fans

Increased operating efficiency and economy without "special" equipment or costly modifications. The secret? It's the design of the new 7-blade "Macheta" Airfoil Propeller!

direct connected

Wider, heavier-sectioned blades, designed expressly to move *more* air at *slower* speeds, require *less* horsepower than conventional types; permit use of *smaller, more economical,* standard-construction motors.

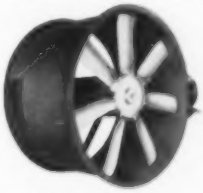


extended shaft

Especially effective against resistances in the 1½" to 4" static pressure range, "SP-7" Fans are adequately powered to prevent motor overload.

direct driven duct

Standard Aerovent assemblies, with "industry's most efficient air-moving surface," now offer the advantage of lower initial cost, reduced operating expense and quieter operation.

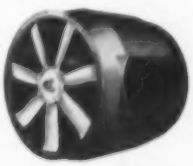


belt-driven duct

Available in sizes 14" to 60" in a wide range of speeds and capacities, these units are supplied for all types of installations and for all operating characteristics.

"bi-flo" duct

Consult your Aerovent representative or write the factory direct for detailed performance data and specific ratings on standard assemblies for every industrial ventilating or air-moving requirement.



All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51

Aerovent fan co., inc.
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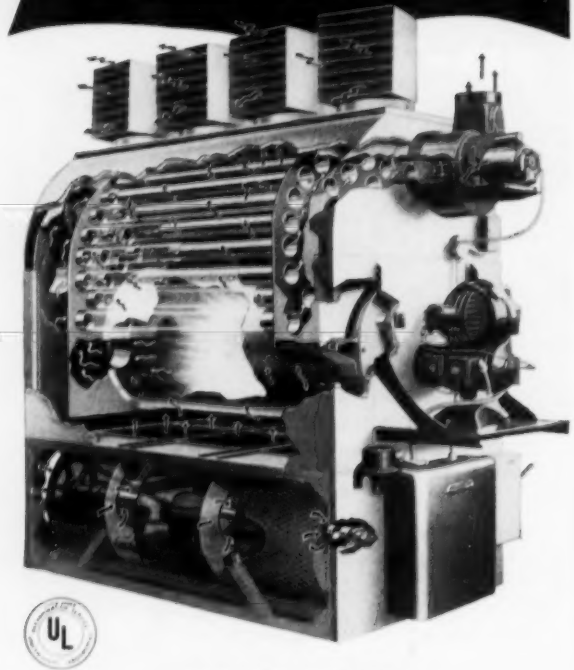

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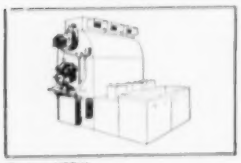
Space Heaters

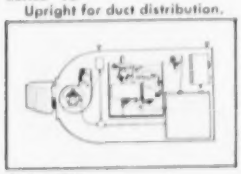
300,000 BTU's

TO 2,000,000 BTU's

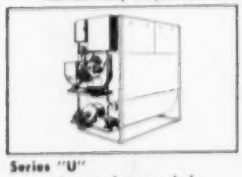
Provides industry with lowest cost heating. Primary cylindrical stainless steel combustion chamber, secondary heat-extracting tubes, consistent rate of combustion gas flow provide high efficiency, utilizing 80% of available heat of fuel. Highly adaptable to desired mounting arrangements. Features low first cost, easy maintenance, complete accessibility to all service points. Completely equipped and wired with controls for economical installation.



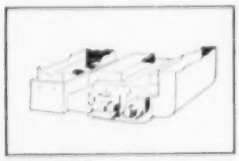
Series "FD"
Upright for duct distribution.



Series "H"
Horizontally suspended.



Series "U"
Inverted suspended.



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Horizontally for duct distribution.

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MEETINGS & CONVENTIONS *Continued*

JUNE 4-8—*National Fire Protection Association*, annual meeting. Hotel Statler, Boston. The association is at 60 Batterymarch St., Boston.

JUNE 11-15—*Electrostatic Precipitation Seminar*. Pennsylvania State University. Chairman: R. E. Armington, assistant professor of electrical engineering, Pennsylvania State University, University Park, Pa.

JUNE 11-15—*21st National Oil-Heat Show*. Coliseum, New York. Managing director: R. H. L. Becker, Oil-Heat Institute of America, Inc., 500 Fifth Ave., New York 36.

JUNE 11-15—*Seventh National Plastics Exposition*. Coliseum, New York. Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36.

JUNE 17-22—*American Society for Testing Materials*. Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 18-20—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Shoreham Hotel, Washington, D.C. ASHAE headquarters: 62 Worth St., New York 13.

JUNE 17-21—*American Society of Mechanical Engineers*, semi-annual meeting. Statler Hotel, Cleveland. Headquarters: 29 W. 39th St., New York 18.

JUNE 21-23—1956 *Heat Transfer and Fluid Mechanics Institute*. Stanford University. General chairman: S. J. Kline, Mechanical Engineering Department, Stanford University, Stanford, Calif.

JUNE 25-29—*American Society for Engineering Education*, annual meeting. Iowa State College, Ames. Secretary: W. Leighton Collins, University of Illinois, Urbana.

SEPT. 17-21—*11th Annual Instrument-Automation Conference and Exhibit*. Coliseum, New York. Sponsored by Instrument Society of America. Exhibit office: 250 W. 57th St., New York.

SEPT. 10-12—*The American Society of Mechanical Engineers*, fall meeting. Denver. ASME headquarters: 29 W. 39th St., New York 18.

HOW TO GET FUEL PUMP PERFORMANCE THAT CUTS MAINTENANCE COSTS

Install

TUTHILL TYPE SU *Pumping Units For Dependable Service in Industrial Heating*

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
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- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

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Dependable Pumps since 1927
939 East 95th St., Chicago 19, Illinois
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Here's where we can save space...and costs

When you make Dorex Air Recovery part of an air conditioning or ventilating system, you reduce—sometimes by as much as two-thirds!—the amount of outside air that has to be taken in.

This means less heating and cooling capacity is needed. Ducts can be reduced in size—portions of ductwork can sometimes be eliminated completely. You save space—and costs.

Dorex Air Recovery "manufactures" *fresh* air by passing *stale* air through scientifically designed beds of special activated carbon—removing all gaseous and odorous impurities. More than 20 years' experience and 10,000 installations prove its effectiveness.

Let us show you—specifically—what Dorex Air Recovery is doing, and how you can benefit by making it part of your installations. Just clip the coupon to your letterhead and mail it to Connor Engineering Corporation, Danbury, Connecticut.

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Please send, without obligation, full information on Dorex Air Recovery.

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Units available for any given temperature need, for both wet and dry operation. Water, and hot gas defrost can be furnished. Special problems needing custom engineered units are our specialty.

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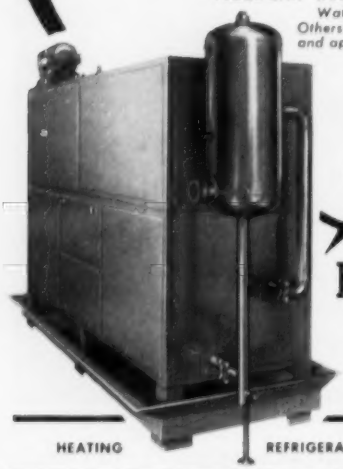

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Send us your specifications

CORNISH-RUTLAND CO.
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Wired Assemblies

MEETINGS & CONVENTIONS *Continued*

SEPT. 24-28—Trade Fair of the Atomic Industry, Navy Pier, Chicago. Conference Headquarters, Morrison Hotel, Chicago. Information: Dan Scherer, Atomic Industrial Forum, Inc., 260 Madison Ave., New York 16.

OCT. 1-3—Heating, Piping and Air Conditioning Contractors National Association, fall board of directors meeting and secretaries' conference. Hotel Statler, Detroit, Michigan. Headquarters: Room 210, Shoreham Bldg., Washington 5, D.C.

OCT. 1-5—National Association of Corrosion Engineers, south central regional meeting. San Antonio. NACE headquarters: 1061 M & M Bldg., Houston 2, Texas.

OCT. 8-12—American Welding Society, fall technical meeting. Hotel Cleveland, Cleveland. Headquarters: 33 W. 39th St., New York 18.

Week of OCT. 15—American Gas Association, annual convention. Atlantic City. AGA headquarters: 420 Lexington Ave., New York 17.

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You *don't* change seats in Dunham Radiator Traps for the simple reason that they don't wear out. Here's why—

Dunham's flat valve disc closes *flush against* the seat. Since the disc does not fit *into* the seat . . . isn't tapered or conical . . . there's little chance for erosion, wire drawing or excessive wear.

In addition, Dunham Traps always assure easy passage of air, water and foreign matter. *No clogging.* Extra large, nonclogging seat opening is unrestricted by any guide. No bellows to stick, no field adjustments to make.

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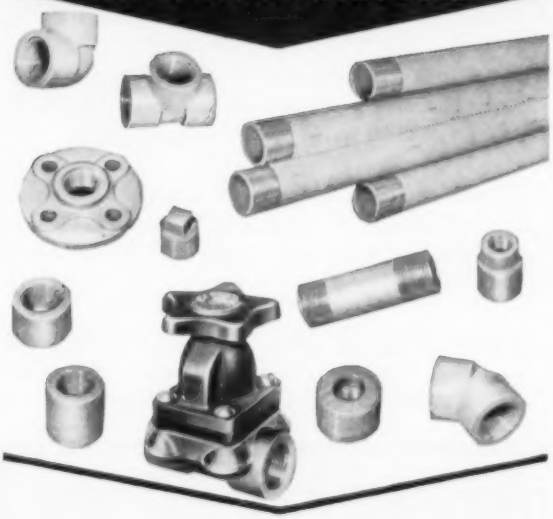
STOP Corrosion with...

Van-Cor

PLASTIC PIPE, FITTINGS AND FABRICATIONS



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AVAILABLE FORMS

PIPE—¼″ thru 8″ diameter (10 or 20 ft. lengths) . . . FITTINGS—¼″ thru 8″ . . . VALVES—½″ thru 2″ . . . SHEETS—1/16″ thru 2″ . . . ROUND BARS—¼″ thru 2″ diameter (10 ft. lengths) . . . WELDING ROD—⅛″ and 5/32″ diameter.

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A rigid unplasticized polyvinyl chloride, Van-Cor is fabricated into such products as: Ducts, Hoods, Chemical Tanks, Tank Liners, Plating Racks, Fume Stacks and Piping.

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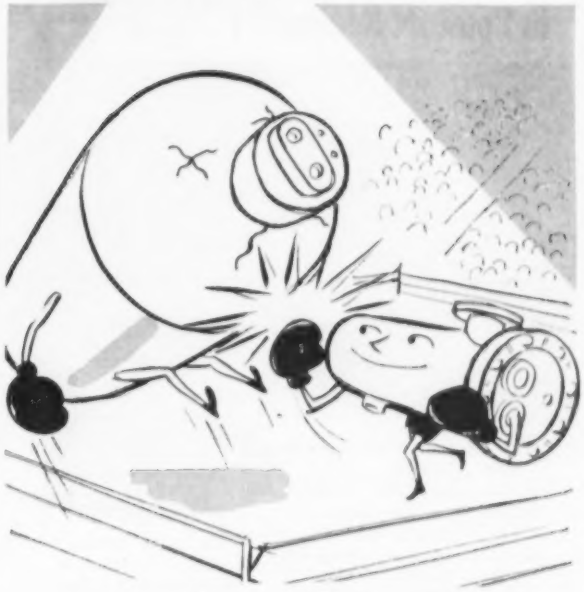
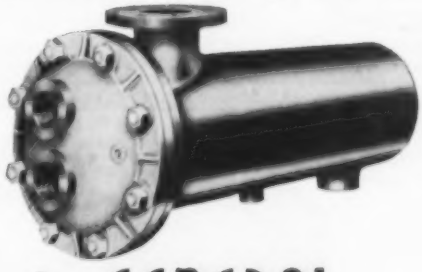


. . . by the really modern water-heating system . . .



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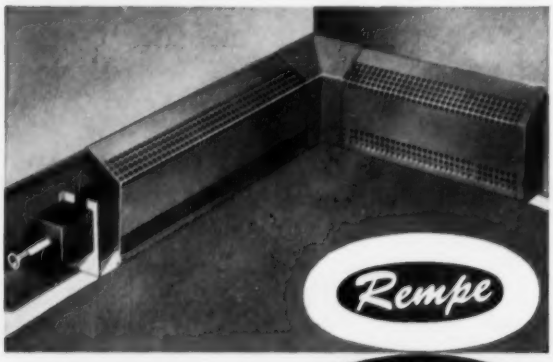

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OCT. 22-24—*American Standards Association*, 38th annual meeting in conjunction with Seventh National Conference on Standards. Hotel Roosevelt, New York, N.Y. Headquarters: 70 E. 45th St., New York, N.Y.

OCT. 22-26—*44th National Safety Congress & Exposition*. Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 24-27—*Air-Conditioning and Refrigeration Wholesalers*, annual meeting. Jung Hotel, New Orleans. Headquarters: 2607 N. High St., Columbus, Ohio.

NOV. 15-18—*Refrigeration Service Engineers Society*, annual convention. Kansas City, Mo. Headquarters: 433 N. Waller Ave., Chicago 44.

NOV. 18-21—*10th Exposition of the Air-Conditioning and Refrigeration Industry*. Navy Pier, Chicago. Headquarters: 1346 Connecticut Ave., N.W., Washington 6, D.C.

NOV. 25-28—*American Society of Refrigerating Engineers*, semi-annual meeting. Boston. Information: ASRE, 234 Fifth Ave., New York 1.

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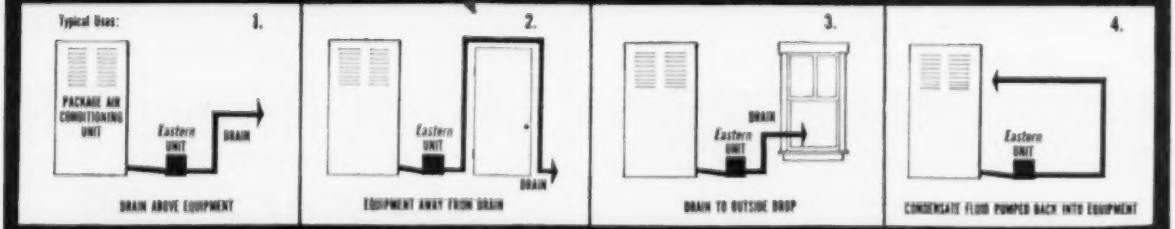

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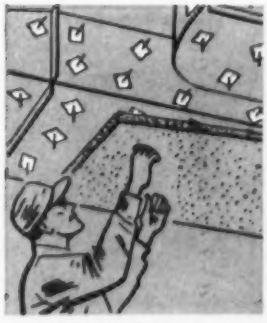

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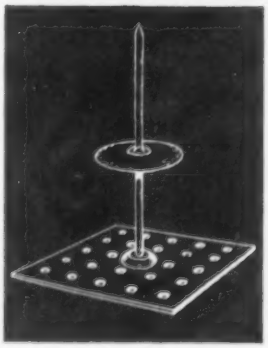

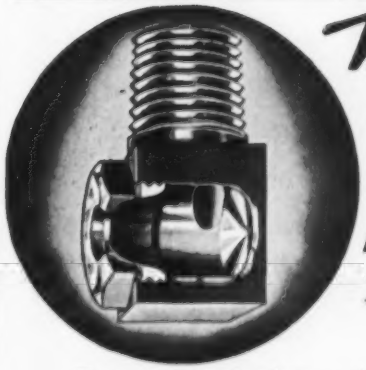

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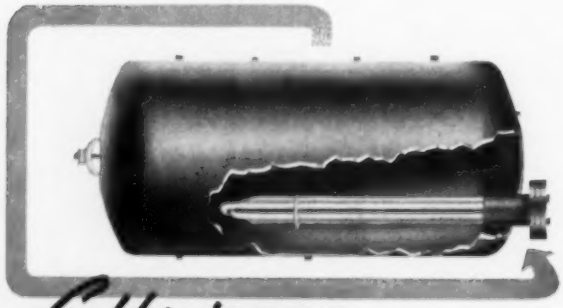
NOV. 25-30—*American Society of Mechanical Engineers*, annual meeting, Statler Hotel, New York. ASME headquarters: 29 W. 39th St., New York 18.

NOV. 26-30—*22nd National Exposition of Power and Mechanical Engineering*. Coliseum, New York. Under auspices of American Society of Mechanical Engineers. Manager: E. K. Stevens, care of the Exposition, 480 Lexington Ave., New York 17.

NOV. 26-30.—*Third International Automation Exposition*. Trade Show Bldg., New York. Management: Richard Rimbach Assoc., Inc., 845 Ridge Ave., Pittsburgh 12.

FEB. 25-*MAR.* 1, 1957—*International Heating & Air-Conditioning Exposition*. International Amphitheater, Chicago. Under auspices of American Society of Heating and Air-Conditioning Engineers, in conjunction with its 63rd annual meeting, also at Chicago. Exposition management: International Exposition Co., 480 Lexington Ave., New York 17. ASHAE headquarters: 62 Worth St., New York 13. ‡



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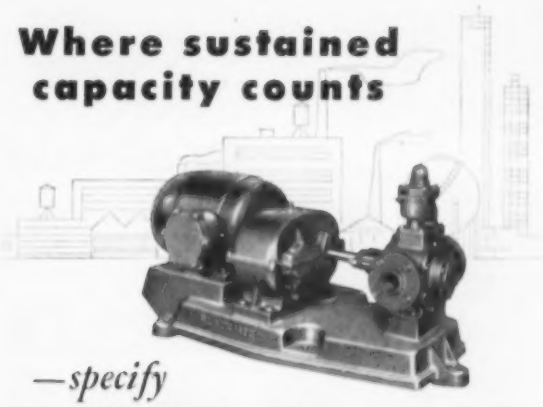

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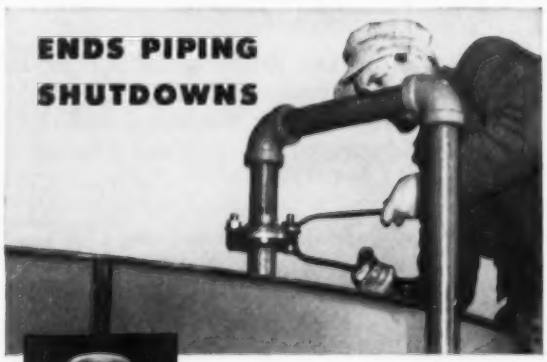

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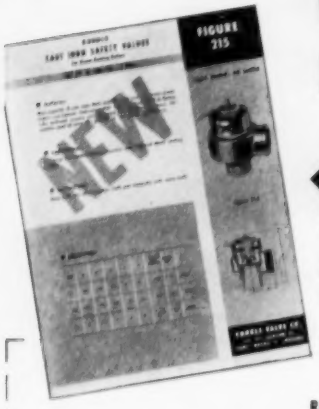

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MASS-TRANSFER OPERATIONS—By Robert E. Treybal. 666 pp. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $9.50.

ATOMIC ENERGY COMMISSION NINETEENTH SEMI-ANNUAL REPORT—200 pp. United States Government Printing Office, Washington, D. C.

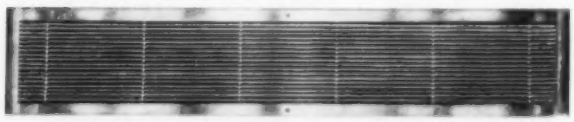
ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES—152 pp. American Foundrymen's Society. Golf and Wolf Roads. Des Plaines, Ill. $6.00 to AFS members, $7.75 to nonmembers.

PRINCIPLES OF CHEMICAL ENGINEERING THERMODYNAMICS—By Ernest D. Wilson and Harold C. Ries. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $7.50.

PITFALLS IN USING MAXIMUM ALLOWABLE CONCENTRATIONS IN AIR POLLUTION—By H. H. Schrenk. Industrial Hygiene Foundation, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. Free.

DIRECTORY OF THE AMERICAN COUNCIL OF INDEPENDENT LABORATORIES, INC.—1956 Ed. H. M. Dudley, executive secretary, American Council of Independent Laboratories, Inc., 4302 East-West Hgwy., Washington 14, D. C. Free.

TECHNICAL DATA CATALOG FOR 1956—Lists available data books on air conditioning, piping, steam engineering, thermodynamic tables and charts, welding, others. Books sell for $1.25 each. Catalog free from Lafax Publishers, Philadelphia 7.



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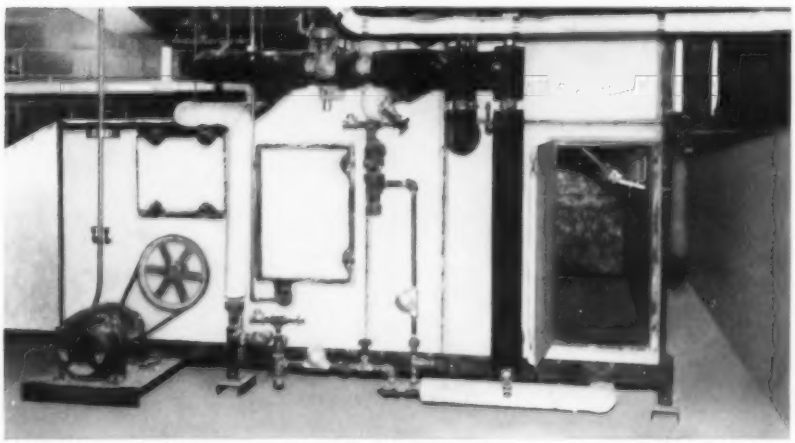

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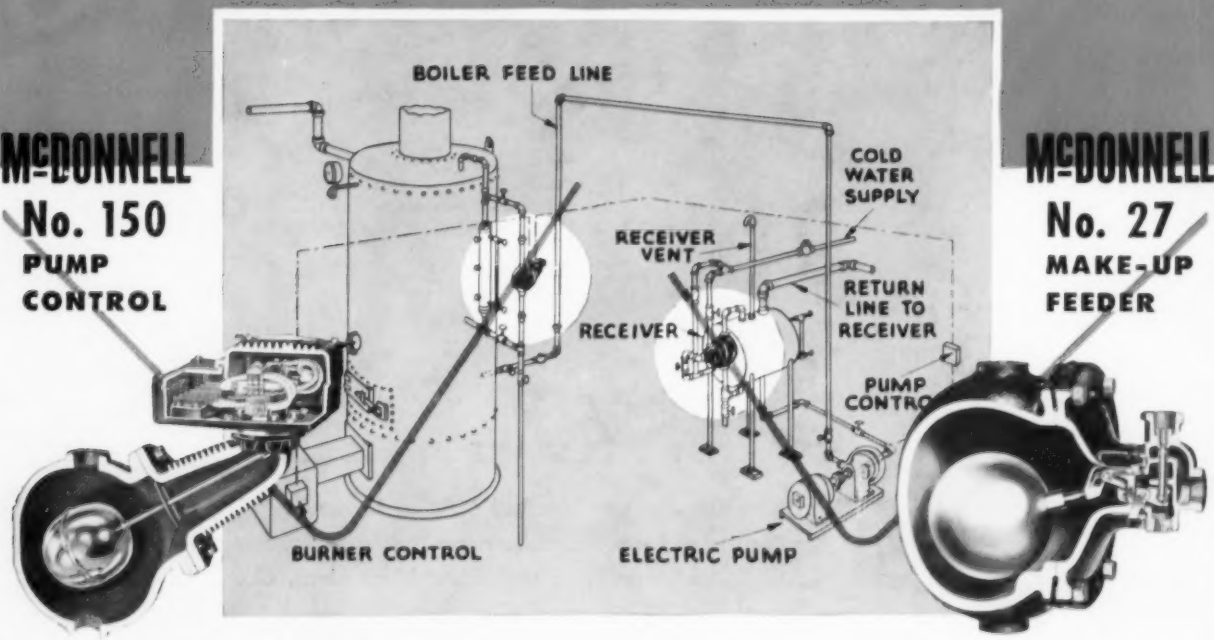

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Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' approved.

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How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27 Make-up Water Feeder on the receiver.

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